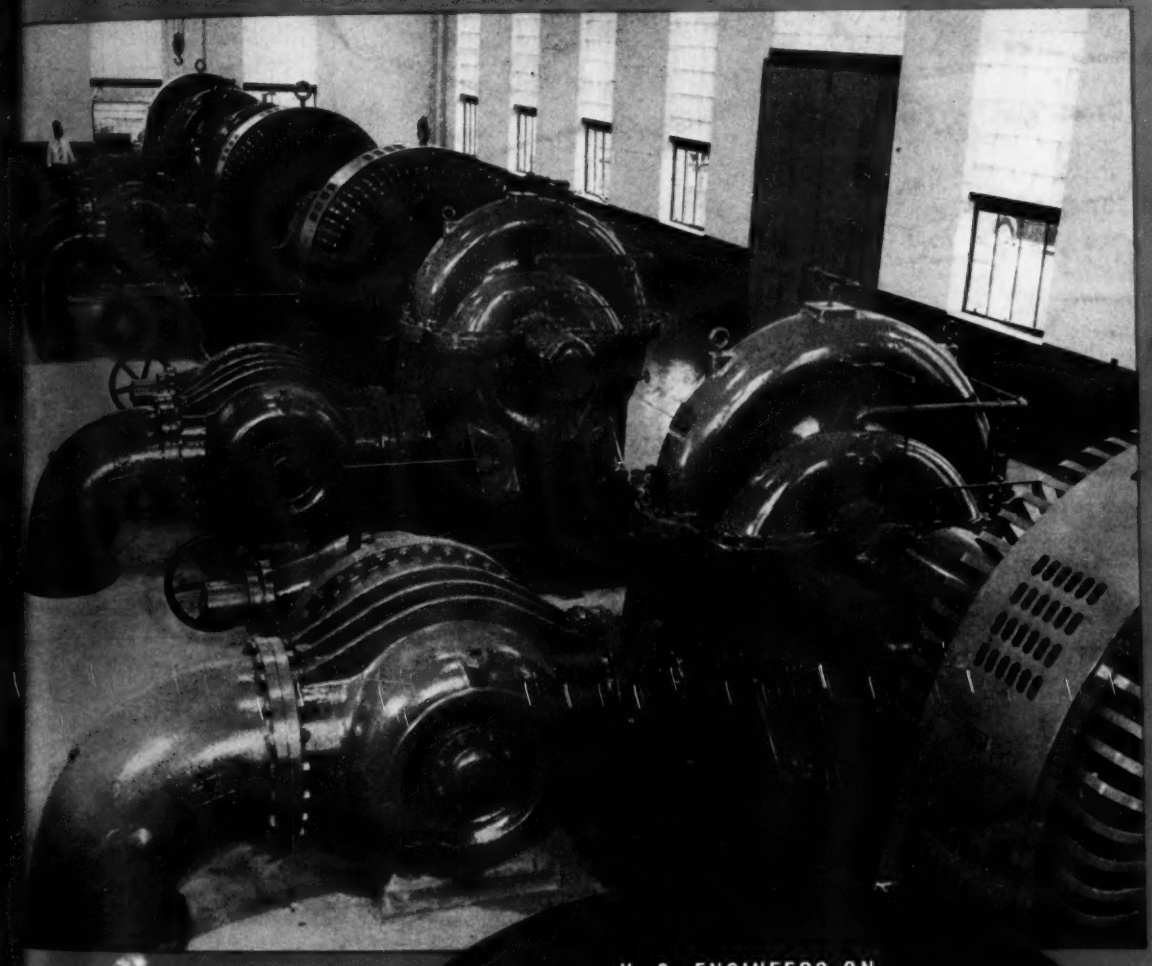
SEP 28 1943

ENGINEERING NEWS-RECORD

SEPTEMBER 23, 1943



U. S. ENGINEERS ON
THE AFRICAN CONSTRUCTION FRONT

BIG TIMBER BLIMP DOCKS
ERECTED FROM TRAVELING TIMBER SCAFFOLDING

KANSAS BUILDS HIGHWAY CULVERTS
OF UNREINFORCED CONCRETE

"Lands like a Feather"...

with a 60-TON JOLT

The heavily-laden plane that lands so smoothly can mean lots of trouble for underground pipe. Even in a perfect "sit down" the impact equals the full weight of the plane. On less-than-perfect landings this force may be doubled or tripled. Yet drainage systems constructed of ARMCO Corrugated Metal Pipe take the punishment without flinching.

Flexible ARMCO Pipe (plain or perforated) has proved ability to resist crushing, cracking or disjointing under the impact and weight of heavy loads. This means freedom from failure even under shallow cover. You have continued assurance of a firm, dry field with uniform support for runways or direct wheel loads. Other advantages include long lengths; band couplers to assure strong joints; and ease of installation with unskilled labor.

Consider ARMCO Corrugated Metal Pipe when you are planning or building essential wartime airports. Ask your local ARMCO man to show you the Manual of Airport Drainage, or write us direct regarding specific problems. Write today to Armco Drainage Products Association, 185 Curtis St., Middletown, Ohio.

Installing 800 feet of 66-inch Corrugated ARMCO Asbestos-Bonded Paved Pipe under runway at large bomber base.

ARMCO

ARMCO

CORRUGATED PIPE

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Shipbuilding, Irrigation, Canals, Railroads

McGRAW-HILL PUBLISHING COMPANY, INC.

Publication Office: 99-129 North Broadway, Albany 1, N. Y. • Editorial and Executive Offices: 330 West 42nd Street, New York 18

JOHN ABBINK, *Publisher*

WALDO G. BOWMAN, *Editor* ALBERT E. PAXTON, *Manager*

Vol. 131 SEPTEMBER 23, 1943 No. 13

COMING NEXT

• To U. S. Army Engineers in the Persian Gulf Service Command must go much of the credit for the recent great increase in Russia's offensive drive. They have turned a wide strip of Iranian desert and mountains into a supply route over which all kinds of materials are moving in to Russia: Port facilities, roads, railroads, airfields, repair shops, plane and truck assembly plants, camps and communication lines have been built. They constitute a spectacular engineering and construction achievement, which will be described by Waldo G. Bowman, in the Oct. 7 issue.

• Sanitary engineers, designers and sewage works operators will find *ENR* for Oct. 7, of special interest. A small sewage plant of unusual design in Costa Rica will be described; septic tanks of plain concrete construction for housing projects; an analytical study and statistical survey of postwar sewage works construction, are highlights among several articles to appear in this issue.

• Data that will enable engineers to calculate accurately the proper spacing of split-ring timber connectors whose axes are neither parallel nor perpendicular to the grain of the connected timbers—data that has long been needed—will be published for the first time in the Oct. 7 issue. Use of the charts and tables will result in more economical designs, which also can be made faster and with greater ease.

LOOKING AHEAD

• War buildings and the special problems that they engender are still very much with us, despite the longing looks that are being directed toward the postwar period. This year's special Building Issue, scheduled for Oct. 21, will, therefore, be largely devoted to buildings whose purpose is to aid the war effort, and whose design and construction have been affected by war conditions. Prominent among these are the structures our Army is building abroad, and a feature of the issue will be another of Waldo Bowman's articles from the European War Theatre. Other articles will present new data on timber, brick and concrete construction.

PAGE

The Week's Events 67
Comment and Discussion 74
Editorials 76
The African Construction Front 78
Blimp Docks Erected with Traveling Timber Scaffolds 84
Hydro-Plant Doubles Costa Rican Power A. N. CARTER 90
New Bridges on the Dixie Highway 93
Booster Station Built in Record Time LOUIS E. AYRES 96
New Method Used to Make Prestressed Concrete Pipe 100
Reservoir Roof of Unreinforced Arches 103
Cement Lining Salvages Hot Water Tanks 106
Timber Water Tank Serves War Plant 107
No Steel in Kansas Concrete Culverts T. W. OLIVER 108
Unit Prices 116
Manufacturers' Activities 130
New Trade Publications 142
Men and Jobs 146
News of the Week 152
Meetings 162
Elections and Activities 164
Construction Reports 181

Number of copies of this issue printed: 36,012

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42d Street, New York 18, N. Y.

Director of Circulation:
Please change my address on Engineering News-Record

From .....

To .....

Signed .....

LIGHT FROM FLOORS

makes your lighting system more efficient

Human eyes are industry's finest and best tools. But they are useless without light. And the amount and quality of light depend not only upon the light source but also upon reflection and diffusion.

Light-colored walls and ceilings long have been used to reflect and diffuse light. Today, light-colored *floors* also are being used to salvage waste light.

These new light-reflecting floors are built of concrete. They are made with Atlas *White* portland cement instead of *gray* portland cement or other darker materials. Hence they reflect more light —salvage waste light. This improvement in illumination—

- ▶ *reduces eyestrain, headaches, and absenteeism;*
- ▶ *decreases accidents, errors and spoilage;*
- ▶ *increases quality and quantity of production.*

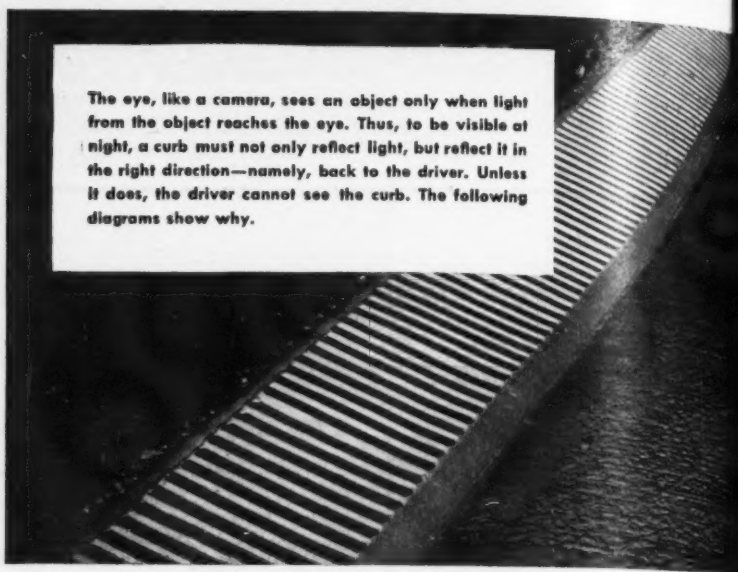
Maintenance of white-cement floors is simple — frequent sweeping, occasional damp mopping, periodic scrubbing.

Send for new book, "Light From Floors." Write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

ENR-F-16

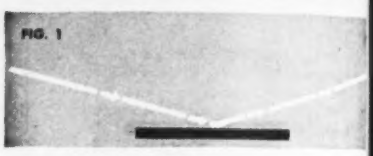
ATLAS
WHITE CEMENT
For Light-Reflecting Floors

SAFER HIGHWAYS



The eye, like a camera, sees an object only when light from the object reaches the eye. Thus, to be visible at night, a curb must not only reflect light, but reflect it in the right direction—namely, back to the driver. Unless it does, the driver cannot see the curb. The following diagrams show why.

When the headlight rays of an automobile strike a mirror-like surface at a flat angle, the light is wasted because it is reflected forward, away from the source. The driver sees nothing.



When headlights strike smooth, dry concrete curb, most of the light is wasted. It is scattered forward and upward—away from the driver. Visibility is poor. (For emphasis, surface texture of concrete is exaggerated.)

On rainy nights, water fills minor depressions of concrete curb, making it like a mirror (as in Figure 1). Headlight rays striking it are reflected forward and upward, away from the driver. Visibility is almost nil.

But when headlights strike the sawtooth surface of a White Concrete Reflecting Curb, the light is conserved —it is reflected back to the driver. On dry nights the curb is bright; on wet nights it is brighter still.

● Day or night, dry or wet, White Concrete Reflecting Curb made with Atlas White portland cement provides a bright guide to safety. For the complete story see the new book, "A White Guide to Safety." Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., N.Y.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

ATLAS WHITE CEMENT
for white concrete reflecting curb

The Week In Engineering and Construction

NGINEERING NEWS-RECORD • SEPTEMBER 23, 1943 • VOLUME 131 • NUMBER 13

Surplus war material problem is considered by Congress

Postwar surplus of $50 billion in military supplies and construction equipment expected. H.R.2795 proposes a program for centralizing disposal of these assets

In a House bill (H.R. 2795) already ssed by that branch and expected to ceive Senate consideration soon, pro- ion is made for a joint congressional mmittee to investigate an anticipated 0 billion surplus in war materials, and port its recommendations to Congress thin six months.

The bill also proposes a general pro- am for centralizing disposal of surplus wornout materials, equipment and sup- ies under the executive branch of gov- nment. This program would become operative at the end of the war with spect to surplus war materials. The ll defines war materials as any tangible roperty owned by the United States or any corporation owned or controlled it which was acquired for military rposes, not including land, buildings, cilities or fixtures.

Of the many provisions of the Surplus ersonal Property Bill, the only one ely for wartime use permits govern- nt-owned equipment to be sold to con- ruction and other private industries for e in prosecution of the war. The House mmittee on expenditures in the execu- e departments reports: "On numerous ld projects of the government, which ve been closed down for the duration the war there are quantities of govern- nt-owned fabricated steel, lumber, and er construction materials which it ould be possible to pick up and put to e in the prosecution of the war."

Registration mandatory

The proposed new law would make it ndatory to register equipment with the ocurement Division of the Treasury partment as it becomes surplus. Both quisition and disposition by the divi- n would be subject to regulations pre- ibed by the President. The division ld set the price of sales under a tem of competitive bidding unless the sident prescribed otherwise.

The proposed plan for disposal of surpluses gives opportunity to purchase: first, to agencies within the federal government; second, to states and territories and political subdivisions; third, to the general public; fourth, to agencies of foreign governments; fifth, to foreign buyers generally. Failing to find a purchaser, the Procurement Division can give the item to tax-supported organizations or charitable institutions. Failing in this, it can destroy it.

Though the various agencies would continue to be free to transfer surpluses within their own jurisdiction, they could do so only upon payment of full value. They would continue to be free to sell their own damaged or worn out equipment and scrap without referring it to the Procurement Division, and also "any products of any public works construction or maintenance project carried on by such agency." If unsalable, equipment could be disposed of as it would be under similar circumstances by the Procurement Division.

Of interest to construction contractors is this statement in the House report: "The most economical and efficient use of many items of equipment, particularly heavy machinery, tractors, road graders,

Concrete cargo barge delivered to Army

The first nine of 26 concrete barges for dry cargo that are being built by Barrett & Hilp in the San Francisco Bay area for the U. S. Maritime Commission have been assigned to the Army. The barges are about 350 ft. long with a carrying capacity of 5,000 tons. They were originally intended for bauxite carriers and are named for minerals, the boat shown moving out for its first "cruise" being the "Agate". First concrete in the hulls was poured March 26 this year, and by Sept. 1, six vessels had been launched and two of them had been delivered ready for service.

These vessels are similar in shape to the concrete tanker barges (ENR June 17, 1943, p. 878; Dec. 31, 1942, p. 902) but have larger open spaces for storage of cargo. The Army plans to load the ship-like barges with supplies and tows them to advanced areas for use as floating warehouses.

William R. Lawson is project manager and George McKeever is general superintendent for Barrett & Hilp on construction of the ships and the new yard, which has 6 building basins.

etc., is obtained only through fullest possible use of such items during their normal life. Every general contractor knows this and fights against the waste of idle equipment."

Another provision of interest to constructors refers to cost-plus-a-fixed-fee contracts. Though profits in general from surplus equipment would go into the Treasury, in the case of property in the custody of a contractor or subcontractor under a cost-plus-a-fixed-fee contract, the proceeds would be credited on the cost of the work.

To avoid former mistakes

The report further says that in addition to approximately $325,000,000 worth of equipment, materials and supplies which at the end of the last war were transferred without pay from Army and Navy surpluses to other federal departments and agencies, sales activities of Army, Navy, Veterans' Bureau, Shipping Board, and the General Supply Committee were carried on, which brought into the Treasury about one and a half billion dollars from surpluses, which had cost perhaps $3,750,000,000. This was a result of negotiated sales, competitive bidding, retail sales through government-owned Army-Navy stores in 26 cities, and public auction. Though refraining from any direct reference to the flooding of the market and the resulting injury to manufacturers, the committee reports that "there were many instances of ill-considered disposal, and comments that "serious question may be raised as to whether the best economic interests of the country were fully served."

The inference is that it is hoped by congressional study and action to avoid such a situation at the close of the present war.

• • •

Engineering societies to share in Alvord estate

Both the American Society of Civil Engineers and the Western Society of Engineers will share in the $200,000 estate left by the late John Watson Alvord, pioneer Chicago engineer who died July 31. (ENR Aug. 5, p. 233). Each of these two societies is to receive one-twentieth of the residuary estate, it was disclosed when Mr. Alvord's will was admitted to probate on Sept. 14.

A business partner, Charles B. Burdick, will receive one-twentieth, and two other associates, Louis R. Howson and Donald H. Maxwell, each will receive one-fortieth of the estate. One percent of the amount is bequeathed to the Y.M.C.A. at the University of Wisconsin. Mr. Alvord's widow, Lucy Bicknell Alvord, will receive about two-thirds of the estate, according to his will.

News-Record wins national editorial award

Last week "Industrial Marketing" announced the winners in its sixth annual editorial competition in which business and technical magazines entered some 290 exhibits. Engineering News-Record was presented the bronze plaque shown above as emblematic of the First Award for the best illustrative treatment of editorial material published during the year ended July 31, 1943.

The award was based on E. R. Denmark's (ENR assistant editor) handling of the Alcan Highway articles by H. W. Richardson (ENR Western editor) which appeared in the Dec. 17, Dec. 31, 1942 and Jan. 14, 1943, issues.

Airplane hits cables on San Francisco bridge

A single-seater Navy fighter plane, flying in low visibility about 9 a.m. on Sept. 12, struck the 2¼-in. suspender cables in a suspension span of the San Francisco-Oakland Bay Bridge, severing one of the suspenders and damaging another. The point of collision was between the center anchorage and the next tower to the east, about 100 ft. from the tower. The plane struck some 160 ft. above the bridge deck and 50 or 60 ft. below the main cable.

Each of the suspender cables starts from a socket in the stiffening truss, extends up to and over a saddle on the main cable and passes then down to the other socket also in the stiffening truss. Two of these loops (a total of four separate lines from deck to main cable) are located at each panel point, spaced on 30-ft. centers.

The plane approached the bridge from the south side, nearly at right angles to the center line. It struck and then passed between two groups of suspender cables 30 ft. apart. This impact damaged and may have sheared off parts or all of the wings but appears not to have broken [illegible] strands in the suspenders on that [illegible] of the bridge. However, the plane continued on its course across the bridge to strike another cluster of suspenders on the opposite side. In this second group one suspender cable was severed and the other was damaged, presumably as the result of impact with the motor.

The suspender cable that was severed was thrust out like a bow-string before it gave way. This was proved by the position of the marks on the 4-in. pipe handrail that was bent outward when the cable was pulled over against it. The angle made by the cable against the handrail indicated that at the instant of maximum deflection the suspender cable at the point of impact must have been at least 25 ft. out of line.

After the impact some small fragments of the plane fell on the bridge deck but the plane itself burst into flames and most of the wreckage fell into the Bay. Two days after the accident neither the plane wreckage nor the aviator's body had been recovered. Traffic on the bridge was delayed only a few minutes and repairs will consist essentially in replacement of the two damaged suspender cables and some minor repairs on the handrail and socket brackets.

• • •

Action taken to protect waters of L. I. Sound

On Sept. 9 the Interstate Sanitation Commission, representing New York, New Jersey and Connecticut, announced that the waters of Long Island Sound from the New York-Connecticut state line to Morgan point, at the eastern end of New Haven Harbor, had been designated as "Class A."

Under the compact of the three states in the fight to end pollution in the metropolitan area, "Class A" waters are those "to be used primarily for recreation purposes, shellfish culture or the development of fish life."

At hearings held at Stamford, Norwalk and Bridgeport, Conn., the testimony unanimously favored the "Class A" designation. New Haven municipal and industrial leaders urged a "Class B" designation for some parts of the harbor of that city because of the presence there of several large manufacturing units.

The commission relied on the recommendations of sanitation engineers, and the bulk of the testimony taken at the hearings indicated the general belief that the primary expected uses of the waters areas in question were recreational and for shellfish culture. It was the opinion of the commissioners that it would be impracticable to separate the sanitation district over which it has jurisdiction into small areas, assigning different water classifications to various segments.

Bureau of Reclamation decentralized to assure full use of western resources

Secretary Ickes announces a reorganization calling for the establishment of six major field offices, each headed by experienced representatives of the Commissioner of Reclamation

As reported briefly in last week's ue, decentralization of the Bureau of clamation to assure a full utilization the land and water resources of the est to meet war and postwar require- nts has been ordered by Secretary of Interior Harold L. Ickes. The re- anization plan, presented to the Sec- ary by Commissioner of Reclamation rry W. Bashore, establishes six jor field offices headed by local rep- entatives of the Commissioner of clamation.

Many new problems

"The increasing number of interrelated d complex problems arising from the nstruction and operation of the many reau of Reclamation projects for irri- ion, power, and related purposes kes it imperative at this time in the erest of maximum efficiency to estab- h area offices to coordinate the or- nization's activities in each of six eas," Secretary Ickes said.

"The plan, developed by the bureau der the former commissioner, John C. ge, prior to his resignation in June be- se of ill health, will bring the bureau closer touch with the people affected its functions. It will provide for a re thorough understanding of area blems and of the needs and potential- es of each area than has been possible retofore through the Washington, D. C., adquarters and the Denver engineer- g office. Close coordination of bureau erations and a full consideration of al expression, essential in meeting the reau's wartime responsibilities and the preparation for postwar needs, l be realized. To facilitate this pro- m, another office of assistant commis- ner was recently established with the pointment thereto of William E. rne."

Wide latitude for directors

The regional directors will have ex- sive latitude for independent action. bject to bureau policies and programs to direction and assistance in the cution of technical phases, the re- al directors will be responsible for rdinating all bureau activities in their pective regions. They will carry out er development and marketing pro- ms, including the negotiation of power contracts in accordance with de- rtmental policy established by the Sec- ary through the power division, and negotiate construction repayment contracts with water users. Under their jurisdiction, but subject to the technical control of the functional branch heads, will be the execution of investigative programs to determine the economic and engineering feasibility for proposed projects, the execution of required agricultural and other economic development programs, and the supervision of the operation and maintenance of completed projects. They will also coordinate and integrate construction projects with other bureau operations in their regions. In addition, the regional directors will provide the administrative management required in their respective regions.

Six regional offices

Commissioner Bashore described the boundaries of each of the six regional field areas and announced the appointment of six regional directors of reclamation as follows:

REGION No. 1. Headquarters: Boise, Idaho.

State of Washington; Oregon, including that part of the Klamath Project in California; Idaho, excluding the Bear River basin; and the Snake River basin in Wyoming.

Director: Frank A. Banks (construction engineer in charge of the Columbia Basin Project, Grand Coulee).

Assistant Director: R. J. Newell (construction engineer in charge of the Boise (Idaho) and Owyhee (Oregon-Idaho) projects.

REGION No. 2. Headquarters: Sacramento, Calif.

State of California, excluding the Klamath Project for the time being, excluding the watershed of the Lake Tahoe area, and excluding the San Diego and Colorado River projects.

Director: Charles E. Carey (consulting engineer for the bureau and former budget examiner, Bureau of the Budget).

Assistant Director: Robert S. Calland (district engineer of the Central Valley Project, California).

REGION No. 3. Headquarters: Boulder City, Nev.

State of Arizona; the San Diego project in California; and the Colorado River projects in California, Nevada, and New Mexico.

Director: Ernest A. Moritz (director of power, Boulder Canyon project).

Assistant Director: Leo J. Foster (construction engineer, All-American Canal and Gila projects).

REGION No. 4. Headquarters: Salt Lake City, Utah.

State of Nevada, excluding the Colorado River projects therein; the Lake Tahoe area watershed in California; Utah; the Bear River Basin in Idaho and Wyoming; and the Colorado River Basin in Wyoming and Colorado, excluding the Colorado-Big Thompson and the Blue River-South Platte projects.

Director: Ernest O. Larson (construction engineer in charge of the Provo River project).

REGION No. 5. Headquarters: Amarillo, Texas.

States of Colorado and New Mexico, excluding all of the Colorado River projects, except the Colorado-Big Thompson and the Blue River-South Platte projects; Texas; Oklahoma; and the Arkansas River Basin in Kansas.

Director: Wesley R. Nelson (chief, engineering division, commissioner's office, Washington, D. C.).

REGION No. 6. Headquarters: Billings, Mont.

States of Montana, North Dakota and South Dakota; Wyoming, excluding the Snake River basin, the Bear River basin, and the Green River basin; Nebraska; and Kansas, excluding the Arkansas River basin.

Director: Harold D. Comstock (superintendent of the Riverton Project).

Assistant Director: William G. Sloan (senior engineer, Bureau of Reclamation).

Changes at Denver

In addition, the organization plan establishes four branches, all located at Denver, Colorado, under the direct administrative supervision of the Commissioner of Reclamation. These are the branch of Design and Construction, which will assume the design and construction responsibilities of the office of the chief engineer at Denver; the Branch of Project Investigations, which will perform the work now done by the project planning section of the chief engineer's office; the Branch of Operation and Maintenance, which will carry out the functions of the operation and maintenance division, as presently constituted, for irrigation activities; the Branch of Fiscal and Administrative Management, which will assume the duties of the office of the chief accountant, including the central accounting office, and those of the general clerical section of the office of the chief engineer.

Commissioner Bashore announced the respective heads of the branches and their titles as follows:

Sinclair O. Harper, Denver, chief engineer, to be in charge of the Branch of Design and Construction; Erdman B. Debler, Denver, director of project investigations; John S. Moore, Denver, director of operation and maintenance; William F. Kubach, Washington, director of fiscal and administrative management.

. . .

WPB orders resumption of work on Illinois road

Completion of the Camp Grant diagonal highway linking U. S. Route 51 and Illinois Route 2, near Rockford, has been ordered by Donald M. Nelson, chairman of the War Production Board, after it was established that no critical materials and only a minimum of manpower would be required.

Denison Dam to be closed by November 1

The Oklahoma State Highway Commission was warned Sept. 13 to get its highways in the Denison Dam reservoir area ready for water to start backing up Nov. 1, when the government expects to close the dam so that the giant reservoir in Texas and Oklahoma will start filling.

Ben Childers, chairman of the commission, said the highway department will salvage a number of bridges that will be flooded when the flow of Red River starts filling the reservoir between Durant, Okla., and Denison, Tex. The commission expects to use the steel from the salvaged bridges in various small projects.

• • •

Many draftsmen needed by federal government

Over a hundred draftsmen are being sought by the U. S. Civil Service Commission for war work in federal agencies. Entrance salaries range from $1,752 to $3,163 a year.

Ship, electrical, mechanical and topographic draftsmen are wanted by bureaus of the Navy Department, the Coast and Geodetic Survey of the Department of Commerce, and the Geological Survey of the Department of the Interior. The Treasury Department and the War Production Board utilize statistical draftsmen.

Qualified engineering draftsmen in any field are urged to apply. However, persons without previous experience in the fields where needs exist may be appointed and trained in the subject. Women are especially desired.

Interested persons may obtain Announcement 283 and application forms from first- and second-class post offices; from Civil Service regional offices; or from the U. S. Civil Service Commission, Washington 25, D. C.

• • •

Only few work stoppages on engineer corps jobs

Work stoppages from all causes, including strikes, on the $6,000,000,000 construction program initiated and supervised by the Corps of Engineers, Army Service Forces, during the fiscal year ended June 30, 1943, amounted to only one two-hundredth of one percent of the total man hours involved in the program, War Department announcement.

Americas to exchange technical society papers

An exchange of technical papers between the engineering societies of this country and of South America is to be undertaken in the near future, according to an announcement of the Inter-American Development Commission, Washington. The exchange is to be administered by the Division of Engineering and Industrial Research of the U. S. Academy of Sciences with the collaboration of the recently appointed Joint Committee on Inter-American Engineering Corporation. The committee consists of Philip W. Henry, chairman, representing the A.S.C.E., George A. Easley, A.I.M.E., W. I. Slichter, A.I.E.E., Thomas H. Chilton, A.I. Ch.E., and Arthur M. Greene, Jr., A.S. M.R., secretary. The committee has its office at 75 West St., New York.

Digests of selected papers are to be translated and sent from this country to South America. Subsequently, it is hoped that papers before the South American societies can be made available to engineers in this country.

The joint committee also is working on preliminary plans for a Congress of Engineering which the South American Union of Engineering Associations hopes to hold in Buenos Aires in 1945.

Water supplies generally continued ample in August

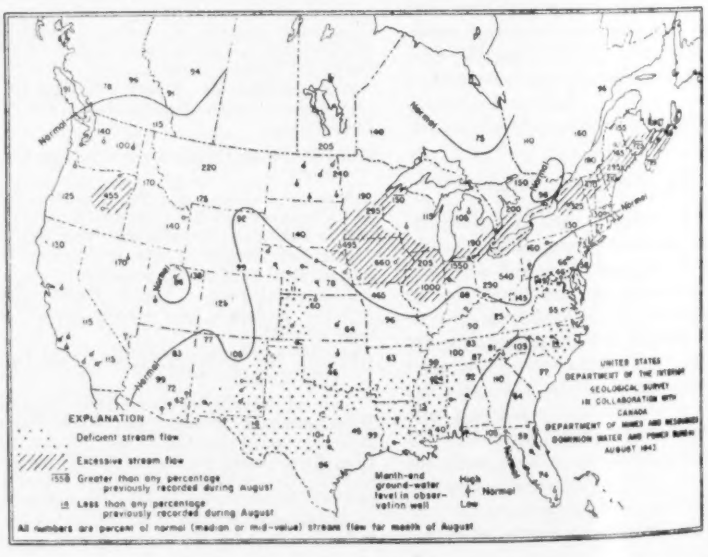
Water supplies for irrigation, power, municipal and industrial use continue good to excellent in the west, the north-central and northeastern states and in Canada, except locally in areas of heavy pumping.

In the east and southeast broad areas of subnormal stream flow have developed as a result of deficient precipitation and high temperature. Continuation of present low precipitation in this area would be adversely reflected in subnormal water supplies approaching drought severity. Reservoir storage, which is now about 80 to 90 percent of one year ago, would necessarily be drawn on heavily.

A drought of severe intensity continues in the south-central United States, embracing southern and eastern New Mexico, western Kansas, western Nebraska, Oklahoma, Arkansas, Louisiana, Mississippi, a very considerable part of west and north Texas, and western Alabama. In this area heavy demands have already been made on storage, and water supplies for stock and for some municipalities are reported low.

August is normally a month in which the underground reservoirs are drawn on heavily to supply the demands of growing vegetation, fair-weather flow of streams and springs, and the pumpage from wells. This August was no exception, and ground-water storage, as shown by the water levels in key observation wells, decreased generally throughout the country. Only in a few localities, such as in parts of the Northeastern States, Georgia, central and southern Florida, eastern Colorado, southern California, and western Washington, were increases in ground-water storage observed.

At the end of the month, the general pattern of ground-water conditions in areas not affected by excessive pumping was essentially as follows: storage normal to low in States east of the Mississippi River, except southern Florida, western North Carolina, northern Michigan, and Wisconsin; and storage normal to high in States west of the Mississippi River, except central Nebraska, southeastern Arizona and southern Nevada.


EXPLANATION
Deficient stream flow
Excessive stream flow
Greater than any percentage previously recorded during August
Less than any percentage previously recorded during August
All numbers are percent of normal (median or mid-value) stream flow for month of August
Month-end ground-water level in observation well
High
Normal
Low
UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY IN COLLABORATION WITH CANADA DEPARTMENT OF MINES AND RESOURCES DOMINION WATER AND POWER BUREAU
AUGUST 1943

A complete flood control system for the Missouri River is proposed

Col. Lewis A. Pick, former Missouri River division engineer, discusses it with business groups in the valley. Arkansas also wants new dams built for flood control and to protect crops

An ambitious plan to convert the Missouri River from a destructive to a productive stream at a cost of hundreds of millions of dollars has been outlined by Col. Lewis A. Pick, former division engineer, Missouri River Division, in talks which he has been making to chambers of commerce and other groups in the territory affected.

"The cost would not be so great that it could not be paid for by the elimination of the damage done by the river," Col. Pick says, in describing a complete flood control system from the upper reaches of the Missouri to its mouth. A series of irrigation projects with power to operate them and a nine-foot channel are part of the scheme. Levees, nine or ten reservoirs and three or four dams are essentials in this over-all plan.

"The dams should be located in the upper reaches of the river," he said. "Possibly one could be in the Yellowstone just before it flows into the Missouri; another below Bismarck, N. D., and others above Pierre and Yankton, S. D. These dams would furnish water for irrigation and for power to pump the water where needed.

"All that has been done by the engineers in the past and all the millions spent have merely made the river ready for flood control. Now that this year's floods have receded a survey shows the stream is precisely where the engineers put it. It has been pegged down to one channel and dikes and other protective works can be placed with assurance," Col. Pick points out.

The colonel's over-all plan will be in the hands of the Chief of Engineers, U. S. Army, shortly.

A new effort to obtain construction of primary flood control dams, this time as a war necessity, has been inaugurated by the Arkansas State Flood Control Commission. Realizing that such a movement would be useless during the war if predicated solely on the necessity of flood control and power development, the commission will base its campaign on the necessity of protecting millions of acres of food crops during the duration of the emergency.

Mr. Morrow said the commission will urge early construction of the projected Fort Gibson and Markham's Ferry dams on the Grand River in Oklahoma; Bull Shoals Dam on the White River in Arkansas; Blakeney Mountain Dam on the Ouachita River, where the Arkansas Power and Light Co. once held a federal construction permit, and the Narrows Dam on the Little Missouri River.

WASHINGTON HIGHLIGHTS

Increases ranging from $1 to $4 per 1,000 board-feet in the base mill prices of Northeastern softwood lumber have been authorized by the Office of Price Administration, effective Sept. 13. The purpose of the increases, OPA has announced, is to maintain production which, it says, has been threatened by manpower shortages and by rising labor and other production costs. It is claimed that even during a normal year at least 15 percent of this type of lumber is produced at a loss.

Only about 20 percent of Northeastern softwood, it is estimated, is now used in essential construction on farms, for defense housing, and such civilian construction as is permitted. The rest goes for crating and boxes.

In order to encourage immediate delivery of oak flooring, which is urgently needed in the war effort, OPA has authorized sale and delivery for direct mill shipment at sellers' present maximum prices established under Reg. No. 458, with the provision that prices may "be adjusted upward in accordance with action taken by the Office of Price Administration after delivery." The order, effective Sept. 8, is the forerunner of an amendment now under study.

Two additional shipyards have been awarded the Maritime "M" by the U. S. Maritime Commission for outstanding production performance. They are Froemming Bros., Inc., Milwaukee, Wis.; and Southeastern Shipbuilding Corp., Savannah, Ga.

Six shipyards previously awarded the "M" have been given Gold Star awards for continued production achievement. They include Bethlehem-Sparrows Point Shipyard, Inc., Sparrows Point, Md.; Consolidated Steel Corp., Ltd., Los Angeles; Federal Shipbuilding and Dry Dock Co., Kearny, N. J.; Kaiser Co., Inc., Portland, Ore.; Pennsylvania Shipyards, Inc., Beaumont, Tex.; and Sun Shipbuilding & Dry Dock Co., Chester, Pa.

Frank C. Emerson, after whom one of the numerous Liberty ships now under construction at the yards of Permanente Metals Corp., Shipbuilding Division, Richmond, Calif., is to be named, besides being an irrigation engineer, was also governor of Wyoming from 1927 to 1930. He served as chief engineer of the Wyoming Land and Irrigation Co. and as state engineer. He had charge of locating the irrigation canals for the Shoshone Indian Reservation in Wyoming.

Use of asphalt, asphaltic products—except road oil—tar, and tar products for paving purchases is now unrestricted, with the revocation by the Petroleum Administration for War of Recommendation No. 45 under which use of these products had been controlled since last October.

In explanation of this action, Deputy Administrator Ralph K. Davies said that during the year military demands have decreased because of the completion of major paving projects. The ban on use of road oil on roads is continued because it is needed in the production of residual heating oil, used in manufacturing and for other essential purposes.

The Public Roads Administration reports that state motor vehicle receipts for 1942 were $448,968,000, approximately nine per cent less than in 1941, but greater than for any year previous to that.

. . .

Building appeals board set up in Bay State

Gov. Saltonstall of Massachusetts has named the membership of the newly created State Board of Standards and Appeals in the Department of Public Safety to pass upon regulations for the construction and use of buildings for public assembly.

The board was created as a result of the Cocoanut Grove holocaust in Boston. Members are to be paid $20 per day for each day of service, with a maximum of $1,000 per year. Those appointed are: W. R. Greeley, Lexington, architect, chairman; W. E. Dibble, Springfield, associate architect; Thomas Worcester, Waltham, and R. U. Cross, Worcester, registered professional engineers; E. J. Ruxton, Springfield, and James F. Fitzgerald, Boston, contractors; E. A. Johnson, West Roxbury, and Harry P. Hogan, Springfield, building trades unions; L. E. MacBrayne, Belmont, executive vice-president Massachusetts Safety Council; and Lt. Com. E. P. Knight, U. S. N., Boston, associate safety engineer.

JOBS OF THE WEEK

DREDGING, New York, N. Y.
U. S. Engineers, New York, N. Y., will dredge deep strip through middle of Ambrose Channel by own forces. The estimated cost is $1,200,000.

RAILROAD BRIDGE, Texas
Southern Pacific Lines, R. E. Barnes, Chief Engineer, Houston, awarded a contract for reinforced contract substructure and structural steel cantilever type railroad bridge over the Pecos River for the Texas and New Orleans Railroad Co. to Brown & Root, Houston. The estimated cost is $800,000.

EXTRUSION PLANT, Nebraska
Anaconda Copper Mining Co., New York, N. Y., will design, construct and operate an extrusion plant, to make aluminum and magnesium parts for military aircraft, by own forces. The estimated cost is $16,000,000. Anaconda Alloys Corp. will operate. Defense Plant Corp. will finance.

TIRE YARN PLANT, Ohio
Austin Co., Cleveland, O., has been awarded the contract to construct a group of plant buildings to manufacture high tenacity tire yarn by Industrial Rayon Corp., Cleveland, O. The estimated cost is $5,000,000. Wilbur Watson & Associates, Cleveland, O., are the architects and engineers.

HOSPITAL, Evansville, Ind.
Gust K. Newberg Construction Co., Chicago, Ill., will construct main patients' building, administration building and superintendent's building, for Evansville State Hospital, Evansville, for $1,493,000; heating and ventilating to L. E. Stevens Co., Cincinnati, O., $187,454; plumbing and refrigeration to Tri-State Plumbing & Heating Co., Evansville, $162,441. The total estimated cost is $2,500,000. McGuire & Shook, Indianapolis, are the architects. J. M. Rotz Engineer Co., Indianapolis, Ind., is the mechanical engineer.

PLANT, Delaware
Nicaro Nickel Co., New York, N. Y., awarded a contract for enlarging and rehabilitating a plant for smelting of nickel oxide to Turner Construction Co., Philadelphia, Pa. The estimated cost is $700,000. Defense Plant Corp. will finance.

OIL REFINERY BUILDING, New Jersey
Lummus Co., New York, N. Y., will design and construct an oil refinery building for Socony-Vacuum Oil Co., Paulsboro, N. J. The estimated cost is $1,500,000. Federally financed.

HOUSING, Texas
Robert E. McKee, El Paso, Tex., was the lowest bidder for housing when the Public Housing Authority, Fort Worth, opened bids, at $1,408,000. Thomas, Sharp, Welch & Goodwin, Dallas, are the architects.

OFFICE, Ottawa, Ont.
H. A. Wickett Co., Ltd., Toronto, Ont., has been awarded a contract by the Dominion Government, Ottawa, for an office building. The estimated cost is $800,000.

HOUSING, Maine
Public Housing Authority, Boston, Mass., awarded a contract for housing to John Bowen Co., Boston, Mass., at $999,000. John Howard Stevens, Portland, Me. is the architect.

HOUSING FACILITIES, New Jersey
Brown & Matthews, Inc., New York, N. Y., will construct housing facilities in Essex Co., for U. S. Engineers, New York, N. Y. The estimated cost is $700,000. Frank Grad & Sons, Newark, N. J., are the architects.

HOSPITAL FACILITIES, Portsmouth, Va.
Virginia Engineering Co., Newport News, Va., has been awarded a contract by Bureau of Yards & Docks, Navy Dept., Washington, D. C., for wards and officers' quarters at Navy Hospital, at $550,100.

DORMITORY HOUSING, Texas
Texas Prefabricated House and Tent Co., Dallas, Tex., has been awarded a contract by Public Housing Authority, Fort Worth, for prefabricated dormitory housing units. $1,200,000. Stone & Pitts and Salisbury, McGinty & Werlin, Houston, are the architects.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 74.

First examinations given to engineers-in-training

Results of the first preliminary examinations given by the New York State Education Department for certificates as "engineers-in-training" have just been made public by D. B. Steinman, chairman of the board of engineering examiners. The examinations were held in June, being the first to be held under the boards new regulations which permit the board to give parts one and two of its three-part examination for professional registration to students when they complete their engineering school training.

The examination was taken by 56 men; 31 passed and 25 failed. Of these 25, 5 failed in only Part I, Structural Planning and Design, and 9 failed only in Part II, Basic Engineering Sciences. Eleven failed in both.

In complete examinations given at the same time for registration as professional engineers, 105 candidates appeared before the board, of whom 62 passed. Thus, the older men made a better showing than the boys fresh out of college.

	Percent Passed	
	Professional Engineers	Engineers In-Training
Part 1 (Structural Planning and Design)	79	73
Part 2 (Basic Engineering Sciences)	78	64
Part 3 (Engineering Practice)	63	(Not given to this group)
Total Examination	59	55

In making these results public, Mr. Steinman notes that the results do not appear to substantiate earlier statements that young men fresh from college would do better on written examinations than the older men. Many of the latter took "refresher" courses before the exams.

• • •

Restrictions are lifted on bituminous materials

Restrictions on the use of asphalt and road tars for street and highway construction and maintenance, in effect since Oct., 1942, have just been lifted by Harold L. Ickes, Petroleum Administrator for war. One of the first states to take advantage of this was Ohio. Officials of cities, counties and townships throughout the state have been advised that they now may make their purchases without the necessity of applying to the state highway department and through the department to the Federal Bureau of Public Roads for a certificate of necessity, according to H. G. Sours, highway director.

Under the restrictions the certificates were issued only when the highway department approved the application as applying to a street or highway essential to the war effort. Restrictions applying in the past to the use of road oil have not been lifted.

OBITUARY

Jacques Rene Alexandre Hagemans, civil engineer and senior inspector of construction for the Navy at Wilmington, Del., died September 4, at West Chester, Pa.

Capt. Kenneth Black, 49, executive officer to the port engineer at the Aberdeen, Md., Proving Ground, died at Baltimore on Sept. 23.

William A. Hansell, 70, for many years a leader in the engineering and construction field in Atlanta, Ga., died there Sept. 9. Mr. Hansell was assistant chief of construction for the city. Previously he had served as chief of construction for Atlanta and as superintendent of public works for Fulton County. He was graduated from Georgia Tech in the first class that completed a 4-year course there. Hansell was one of the leaders in developing Atlanta's metropolitan sewerage system.

John E. Ballenger, 59, builder, died at Deland, Fla., Sept. 12. At one time he was assistant commissioner of public works for Jacksonville. He founded a construction company in 1930 and handled many large highway and airport construction contracts in Florida and other southern states.

Louis Heller, dean of Mahoning County, Ohio, builders, died Sept. 6, at Youngstown. He built the Nela Park plant of the General Electric Co. in Cleveland, and 40 churches and hundreds of other private and public buildings in Cleveland, Pittsburgh and other cities.

Orville A. Smith, 64, died Sept. 5 at Marino, Calif. He was graduated from the University of Missouri in the engineering school, and for the past eighteen years had been in the office of the city engineer of Los Angeles. Prior to that he was a member of the firm of Black & Veatch, engineers, of Kansas City, Mo. He was a veteran of World War I, and held the rank of major in the reserve corps.

Eric H. Frisell, 69, prominent California civil engineer, died on Aug. 23. Born in Sweden, he was graduated from the Stockholm Polytechnic Institute and came to this country in 1895. After building bridges and buildings for the Pennsylvania Steel Co., in 1905, he was sent to Norway by Millikan Bros., New York, as chief engineer of a $10,000,000 project. From 1908 to 1912 he was chief engineer for Millikan Bros. and later represented them in San Francisco, where he built numerous important buildings. For 17 years he was president of the California Steel Co., San Francisco.

A. K. Haxstun, highway engineer with the Public Roads Administration, died Sept. 4. Mr. Haxstun was a graduate of Yale University. He served overseas in World War I, following which he was employed on location and heavy construction with the North Carolina State Highway and Public Works Commission, the Mexican National Highway Commission in Mexico, the American Road Builders Association, and since 1928 with the Public Roads Administration.

George Vang, 64, bridge and highway builder and former polo player, died at Pittsburgh, Pa., Sept. 18.

In thirty-four years Mr. Vang's company built projects costing $70,000,000. He constructed bridges in Pittsburgh, Chattanooga, Harrisburg, Louisville and other cities, built many river dams and was a pioneer in promoting the $70,000,000 Pennsylvania Turnpike. Mr. Vang superintended construction of the Marysville Bridge near Harrisburg, said to be the largest four-track stone arch in the world.

News of the Week
Continued on p. 152

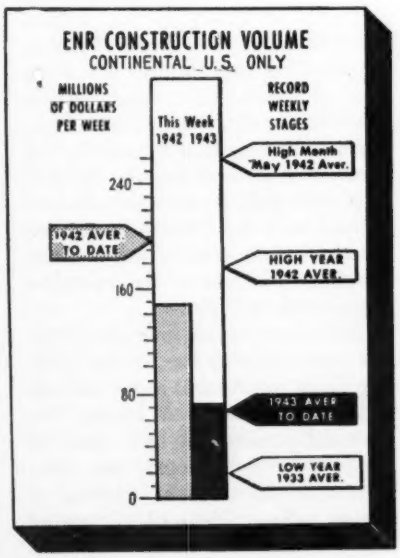
CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction volume in continental U. S. totals $71,951,000 for the week. This volume, not including the construction by military combat engineers, American contracts outside the country, and shipbuilding, is 66 percent higher than in the preceding week, but 51 percent lower than in the corresponding 1942 week. Comparisons with a week ago show private work 53 percent higher, and public work up 68 percent as a result of the 27 percent rise in state and municipal construction, and the 77 percent climb in federal volume. Private work tops the 1942 week by 25 percent, but public construction is down 55 percent.

The current week's construction brings 1943 volume to $2,437,651,000, an average of $64,149,000 for each of the 38 weeks. On the weekly average basis, 1943 volume is 67 percent below the $7,632,606,000 reported for the 39-week 1942 period. Private construction, $312,444,000, is 32 percent lower than a year ago, and public construction, $2,125,207,000, is down 69 percent when adjusted for the difference in the number of weeks.

In the classified construction groups, gains over last week are in bridges, industrial and public buildings, and earthwork and drainage. Gains over the 1942 week are in bridges, industrial buildings, and earthwork and drainage.

New capital for construction purposes for the week totals $100,811,000, and is made up of $100,000,000 in federal appropriations for construction, and $811,000 in state and municipal bond sales. New construction financing for the 38 weeks of 1943, $3,030,299,000, is 67 percent below the $9,530,701,000 reported for the 39-week period last year.



CONTRACTS

Continental U. S. Only (Thousands of dollars)

	Week Ending Sept. 24 1942	Sept. 16 1943	Sept. 23 1943
Federal	$132,736	$30,535	$54,094
State & Municipal	7,344	6,579	8,366
Total public	$140,080	$37,114	$62,460
Total private	7,619	6,218	9,491
TOTAL	$147,699	$43,332	$71,951
Cumulative 1943	(38 weeks)		$2,437,651
1942	(39 weeks)		$7,632,606

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	1942 39 weeks	Cumulative 1943 38 weeks
NON-FEDERAL	$563,803	$276,461
Corp. Securities	169,889	17,408
State & Mun	181,759	98,920
R.F.C. loans	129,455	9,000
FPHA loans	.....	3,133
R.E.A. loans	.....	20,000
Fed.-Aid Hwy	82,700	128,000
FEDERAL	$8,966,898	$2,753,838
TOTAL CAPITAL	$9,530,701	$3,030,299

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost	Sept. '43	294.09	141.37
Building Cost	Sept. '43	231.20	124.98
Volume	Aug. '43	119	52

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Tributes to L. S. Moisseiff

Leon S. Moisseiff, who died Sept. 3, was not only one of America's most noted structural engineers, but a man who could number among his close personal friends most of the leaders of the civil engineering profession and construction industry, as the following extracts of letters from some of them make clear.

With the passing of Leon Moisseiff the civil engineering profession has suffered a great loss, not only on account of his technical skill and broad experience in the design of many prominent structures, but also the loss of his contribution to the profession through his excellent papers on many varied subjects. In addition to his skill as an engineer he was especially fond of the finer things of life, such as art, music and good literature, and was a well read, well posted man on these subjects.

During a period of many years of close personal contact with Mr. Moisseiff, I became a great admirer of the man personally. He was a wise philosopher and counsellor, and his advice was always tempered with his many years of experience. He had, as well, the faculty of listening to the advice and counsel of others and profiting by their experience. He was always ready and willing to admit and correct his own errors in thinking or judgment. I feel that I have lost one of my best friends.—**F. M. Masters,** *Consulting Engineer.*

The sense of personal loss in Leon Moisseiff's death blurs a clear view of his professional achievements, yet the debt we owe him for advancing our knowledge of suspension bridges and efficient utilization of materials is unmistakable. I can still see him, at barely thirty, working out the epochmaking conception of flexible towers for the Manhattan Bridge and, with keen structural insight, boldly using unit stresses beyond 25,000 lb. The understanding mind of those days, accompanied by his sound practical sense in happy partnership with imagination, remained active throughout his long service to the big East River bridges, and was of notable value in dealing with the difficult problems, now largely forgotten, of the Queensboro Bridge, soon after the tragic collapse at Quebec.

It was these gifts that in his mature career made him a leading counselor for a long list of great structures, from Philadelphia to Golden Gate and Whitestone. They were the source, too, of his suspension bridge theory, his efficient live-load systems and his studies of bridge steels, which enriched the art as his lucid writings enriched the literature of bridges. He gave a lifetime of unremitting service to the profession, and graced it with sympathetic and ever helpful kindliness.—**F. E. Schmitt,** *U. S. Bureau of Reclamation.*

Leon S. Moisseiff occupied a singular and outstanding position in the engineering profession, particularly in the field of structures. He was an untiring and profound student in this field of engineering science, conversant with the developments in this as well as foreign countries and a frequent contributor to structural theory and the literature thereon.

Besides his unusual scholarly attainments in theory he was a keen observer of the more practical phases of structural engineering, the materials of construction, their fabrication and erection. His close association with the study and carrying out of many important engineering projects of a public character also developed in him a good judgment on practical administrative and political questions with which the executive engineer is confronted.

This rich professional knowledge was combined with fine human qualities which contributed to his successful collaboration with others. Mr. Moisseiff possessed a keen sense of humor which reflected his deep knowledge and unbiased judgment of human nature. He was tolerant of the views of others, ready to give unselfish help and advice and willing to allow credit where credit was due. It was against his nature to disparage the work of others or indulge in self-laudatory or self-advertising practice.

These qualities made Mr. Moisseiff eminently fitted to act as a technical adviser to the executive engineer, and it is largely in this relationship, during the past eighteen years, that the writer learned to esteem his ability and character. This association embraced the design and construction of the George Washington Bridge, the Bayonne Arch, the Triborough and Bronx-Whitestone Bridges. In similar capacity as consultant Mr. Moisseiff was connected with the Transbay and Golden Gate Bridges in San Francisco and the Tacoma Narrows Bridge. Previously he had been in responsible charge of the design of the Manhattan Bridge in New York and the Delaware River Bridge in Philadelphia. His death terminated his recent engagement as an adviser in the investigation of the Brooklyn Bridge, the rebuilding of which had previously been an object of his studies.

Thus the many outstanding bridges with which Mr. Moisseiff was connected include practically all of the modern long span suspension bridges, and it is in this specialized field that he made his most valuable contributions and established for himself a world-wide reputation. In the early years of this century he developed a detailed analysis of stresses in the so-called braced-cable type of suspension bridge and applied it to a design of this type then proposed by Gustav Lindenthal for the Manhattan Bridge. (*Trans.* Am. Soc. C. E. Vol. 55.) The theory of this type had previously received only scant attention in engineering literature. Although this type of suspension bridge has never become common in this country, nor has ever been applied to a long span suspension bridge actually built, it appeared as a competitive design in preliminary studies for a number of important bridges.

For the final design of the Manhattan Bridge as a common suspension type with stiffening trusses along the floor, Mr. Moisseiff developed a complete set of formulas based, for the first time in this country, on the so-called "deflection theory", which had been developed in Europe, no-

tably by Prof. J. Melan in Prague. In distinction to the previously prevalent "elastic theory" based on an assumed rigid system, the deflection theory recognizes that the suspension structure changes its form under load and that the dead load may moderate to a substantial degree the live load distortions. The deflection theory thus is not only far more accurate, but in long spans permits very material economies. Mr. Moisseiff elaborated and simplified Melan's theory, and through its publication as part of the report on the design of the Delaware River Bridge it became more widely known and eventually commonly applied in this country.

In his paper (*Trans.* Am. Soc. C. E. Vol. 98) entitled "Suspension Bridges Under the Action of Lateral Forces" written jointly with his associate Frederick Lienhard, Mr. Moisseiff presented a unique refinement of this phase of suspension bridge design.

Mr. Moisseiff's keen interest in research in connection with materials of construction is reflected, among other contributions, in his excellent report on the investigation of cold-drawn bridge wire (*Proc.* Am. Soc. for Testing Materials, Vol. 30) which was made at Lehigh University in 1930. This investigation was occasioned by the failure of heat-treated wire in the cables of the Mount Hope and Detroit suspension bridges and contributed to renewed confidence in the cold-drawn cable wire.

The one great disappointment in Mr. Moisseiff's career was the failure of the Tacoma Narrows Bridge, the design of which he had originated and guided. It would be improper for his fellow professionals to put the blame for that failure entirely upon Mr. Moisseiff's shoulders. Usually conservative in his judgment, but open-minded toward improvements in engineering practice, he followed a trend in long span suspension bridge design which appeared justified, but in which, as is now well recognized by those who have studied the problems involved, neither theory available at that time nor practical experience furnished an adequate guide. The Tacoma Bridge exemplifies human progress into new and unexplored fields of magnitude which is unconsciously made at the risk of failure, but which on the other hand furnishes most valuable lessons.

Undaunted by this unfortunate experience, Mr. Moisseiff's last efforts were devoted to assisting in the solution of the problem forced upon the profession by the Tacoma Bridge failure, namely the behavior of suspension bridges under dynamic wind action. The Public Roads Administration appointed him as one of its representatives on the Advisory Committee on Long Span Suspension Bridges, which was organized under its auspices to explore that problem. Mr. Moisseiff acted as chairman of the Subcommittee on Interpretation and Analysis. Unfortunately he could not live to see that task completed.

In honor of his professional contributions Mr. Moisseiff was awarded the gold medal by the Franklin Institute, the Norman Medal and the James Laurie Prize by the American Society of Civil Engineers, the Egleston Medal of Columbia University and the Modern Pioneer Award for achievement in the field of science and invention by the National Association of Manufacturers. — **O. H. Ammann,** *Consulting Engineer.*

Mr. Moisseiff was not only an exceptionally able mathematician and structural engineer, but was generous with his time for committee work in the interests of the profession. He was always without prejudice, progressive and fair, and his observations were always well reasoned and strictly to the point. Also he was a most gentlemanly and entertaining companion. His many associates in this type of effort will equally miss his counsel and his personality.— **Jonathan Jones,** *Chief Engineer, Bethlehem Steel Co.*

The death of Leon Moisseiff was a great blow to the engineering profession.

The public at large never knew this great engineer, for he worked quietly, without fanfare. The engineering profession alone knew his accomplishments and his contributions to engineering literature.

All the bold achievements of bridge engineering during the last twenty years felt the guiding hand of Moisseiff, and we are going to miss this guidance in the development of new products of engineering and when building new and bolder projects.

He was a most conservative critic and always one step ahead in any advancement suggested. It is deplorable that he could not have been spared at least until the completion of the investigation now being made covering the entire range of fundamentals of long span suspension bridge design, for he was most active in this investigation and deeply interested in the economic solution of aerodynamic instability.—**C. C. Sunderland,** *Chief Engineer, Bridge Dept., John A. Roebling's Sons Co.*

I knew Mr. Moisseiff for many years and have always considered my association with him in connection with notable bridge projects to be the most pleasant and valuable of my experiences. His interest and direct connection with practically all of the great suspension bridges constructed within the past decade have without doubt established his name as the highest authority in that engineering field. Not only as an engineer but as a man, Mr. Moisseiff possessed the finest personal qualities — broad-minded and charitable and highly considerate of others.

In his passing the profession has lost one of its outstanding members. His work stands as a perpetual reminder of his greatness.—**Chas. E. Andrew,** *Washington Toll Bridge Authority.*

My first reaction to the passing of Leon Moisseiff was not so much the fact that our profession had lost one of its foremost engineers as that I had lost a real friend. I am sure that many others will have the same reaction.

In the early days of my professional career, I was of the opinion, so often expressed by engineers, that the so-called engineering habit of mind, developed under the discipline and restraint of Nature's immutable laws, would prove of great service in the solution of many of the more vital problems of human society.

I still believe that this *should* be the case, and my disappointment at finding it otherwise has led me to an even greater appreciation of, and affection for, the few great men of our profession whose vision extends beyond the range of their technical activities.

Such a man was Leon Moisseiff. Fortunately, his spirit is one of those that does not die, but carries on in the minds and hearts of those fortunate enough to know him well.— **Comfort A. Adams,** *E. G. Budd Mfg. Co.*

EDITORIALS

VOLUME 131 NUMBER 13

September 23, 1943

Split-Shifts for Engineers

GREATER CONTRIBUTIONS TO THE WAR effort on the home front could be made by engineers, individually, by patterning their spare-time activities along the lines followed by municipal employes in many sections of the country. On the West Coast, for instance, aircraft factories are using city employes on 4-hr. half shifts each night after their regular working hours. On the East Coast, municipal employes spend extra hours at irregular times repairing convoy ships when they arrive, while others drive busses on week-ends after their regular jobs are finished. Many engaging in this extra-employment are civil service employes who desire to aid the war effort as well as increase their income. Engineers can do much to alleviate the manpower shortage by engaging during their spare time in whatever essential activities may be available in their local communities, regardless of whether such work is allied with their vocational training.

Avoid Duplication

THERE ARE SIGNS that wasteful duplication of effort may occur in current plans to stimulate early preparation of plans for post-war construction. In June the American Society of Civil Engineers appointed a committee for the purpose of stimulating interest in postwar planning; more recently a joint committee was set up by the leading organizations in the waterworks and sewage disposal fields; and now the American Road Builders Association has added a new man to its staff to concentrate on postwar highway planning. All this is desirable from the viewpoint of stimulating public interest in postwar planning. But one of the next steps, after the educational program, will be the compilation of records of specific projects and their status. Already, the Federal Works Agency, in anticipation of a study of the subject by Congress, has begun a move to collect such data. It lacks funds and staff to make a complete check and so for the present must depend on help from voluntary agencies like the A.S.C.E. committee and on records such as the construction reports of this journal and of the several governmental agencies. Before compilation and analysis of statistics is undertaken actively, the organizations interested in postwar construction planning should look into the possibilities of centralizing, at least, this phase of their work. Duplication of effort should be avoided.

Increased Road Maintenance

ROAD MAINTENANCE EXPENDITURES must continue at a high rate despite curtailed gasoline consumption. This fact needs to be emphasized because many persons, especially some in legislative halls of Atlantic Seaboard states where the gasoline cut is most drastic, believe that our roads are not being used nearly as intensively as in peace-time and so are not wearing out as fast. Actually, truck traffic—which is the most destructive element of road traffic—is above normal, and passenger car traffic, especially around the large cities, continues at a fairly high rate. Elsewhere it is down only about 35 percent. A factor adding to the maintenance problem is the sharp decline in road replacements that the war has made necessary. So long as the ban on new road construction must be continued, we can look forward to progressively rising road maintenance costs. This fact needs to be impressed on legislative bodies that write road budgets.

Construction Photographs

RECENT YEARS HAVE WITNESSED a great increase in the number of photographs taken on construction jobs, without registering a comparable increase in the quality of the pictures taken. We are naturally, and somewhat selfishly, interested in the subject, because good illustrations make good articles better. But there is equal advantage to the engineer and contractor if his job pictures show something really useful, and show it to good advantage. Two shortcomings may be cited with respect to construction photos: Too many of them are so-called "progress" pictures, taken from a designated (and usually distant) point on the first of the month; and too many of them are snapped by persons not conversant with construction. Responsibility for good construction pictures rests not alone with the photographer, but with the man in charge of the job, who can do much to direct when, where and what pictures are to be made. Detail pictures are worth their cost for job records, for reminders in the future of methods used on present jobs, and to show others how a difficult operation was per-

formed. A good rule to follow is to take a picture of the details of every accomplishment of which you are especially proud.

The Route to Recognition

Part of the engineering profession for some time past has been trying to develop greater public recognition through use of the title "Engineer" before the names of registered professional engineers in printed programs, society journals and as a form of address in society meetings. Precedent was found in practice in some parts of Europe; and in South America, where engineers are few in number and highly respected as a group, the term "Ingeniero" is a common form of address. In its actual workings, the scheme was complicated somewhat by the fact that some engineers have scholastic doctorates or former military titles by which they like to be addressed, hence, even within the state societies of professional engineers, where the practice has been fostered, there has been no consistency, and a promiscuous use of the titles "Doctor", "Colonel" and "Engineer" has resulted. And, of course, insofar as the general public is concerned, no progress at all has been made.

That there is a growing inclination toward discarding this practice is indicated in a statement made recently by James F. Fairman, president of the New York State Society of Professional Engineers, before the Pennsylvania society. Speaking as an individual, Mr. Fairman said: "Even some of our bright ideas may backfire. I refer to the use of the term 'Engineer' as a form of address in lieu of the time honored and plain 'Mr.' This usage appeals to many people as an attempt to lift ourselves by our bootstraps; others less kind label it silly affection."

Is it not long past time that this attempt to lift the engineering profession by its bootstraps to a higher place in public recognition be abandoned? Use of titles goes contrary to the principles on which this nation was founded, for the man to whom chance has brought an opportunity to become an engineer deserves no distinction over and above the man to whom that opportunity is denied.

Engineering as a profession will rise or fall in public esteem as its individual members rise above the crowd or are lost in its midst. If the profession sets service as a goal instead of adoption of a meaningless title, it will in the end get its full measure of public recognition.

Waste in War Construction

War is looked upon as necessarily wasteful. On the battle front, men, munitions and equipment are used with abandon to obtain an objective; on the home front, men, materials and time are employed extravagantly to gain time in getting men, munitions and equipment to the battle front. In the stage of the present war through which we have been passing, the effect of this wasteful philosophy on the engineers and constructors who have built our camps, military bases and war plants has been to dull their normal sense of the need for economy in construction operations. Now that we are entering a new phase of the war, the phase in which much of our construction will be abroad, these men need to reincarnate their ability to do a job well with a minimum of materials and equipment.

This fact was emphasized earlier in the year by Col. F. C. Nottingham, deputy chief engineer of the British staff in Washington, in speaking to engineer officers at Camp Claiborne, La., who had come from jobs as contractors or engineers in civil life to take over the command of the construction units being trained in that camp for service abroad. Pointing to the fact that shipping space is the greatest bottleneck in the war plans of the United Nations, Col. Nottingham urged on his hearers the need for the utmost economy of materials and equipment in the activities that they are to direct at points far from their bases of supply. Every pound of imported material that is wastefully used at the front is just that much shipping space wasted, and just that much less space that is available for munitions, food and other supplies on the ship and rail lines that move supplies to the front he said.

That lesson is not without applicability at home as we change from the stage in which we are creating a war machine to the stage in which production of war materials in ever-increasing volume is our goal. Needless waste of anything, from food to the paper on which we write, means just that much less shipping space on our inland transportation system in which to move military supplies to the ports.

And it is pertinent to carry this line of reasoning farther, and to think of the design and construction problems that the postwar period will bring. For their proper solution, economy, not waste, will have to be the watchword. No longer can men, materials and equipment be used with prodigal abandon, if the wants and needs of the nation are to be satisfied.

ENGINEERING NEWS-RECORD WALDO G. BOWMAN, *Editor* **Copyright, 1943, by McGraw-Hill Publishing Company, Inc.**
EDWARD J. CLEARY, *Managing Editor. New York:* V. T. BOUGHTON, A. N. CARTER, H. W. HUNT, E. R. DENMARK. *Chicago:* H. W. RICHARDSON, J. R. CARR. *Washington:* PAUL WOOTON, R. B. COLBORN. *San Francisco:* N. A. BOWERS. *Consulting Editors:* F. E. SCHMITT, W. W. DeBERARD
EDITORIAL OFFICES: 330 WEST FORTY-SECOND STREET, NEW YORK, N. Y.

ENGINEERING ABROAD AS SEEN BY ENR EDITORS

The African Construction Front

Waldo G. Bowman

Editor, Engineering News-Record

(By airmail from Middle East Theatre of Operations)

***Contents in Brief**—Since early in 1942 American construction men and Army Engineers have been transforming bits of Africa bordering on the Mediterranean and Red Seas into military installations that have already proved their great importance. Modern construction machinery and primitive native hand labor methods have been used side by side. What construction in Africa has entailed is outlined in this latest dispatch mailed from Cairo.*

A 3,500 MILE DOG-LEG STRIP of North Africa from Casablanca in French Morocco to Asmara in once-Italian Eritrea is territory that thousands of American engineers and construction men will never forget. As members of the U. S. Armed Forces, they have marched and fought, built airdromes and roads, cleared minefields and harbors along it. As civilian employees of the American construction firm of Johnson Drake & Piper, they have constructed depots, shops, camps, airfields, roads and harbor installations within its confines. And whether in khaki or work clothes they have seen comrades die and be buried in it.

In all of this activity, of course, they are only repeating in the 20th Century what has been going on for thousands of years along Africa's Mediterranean and Red Sea shores. Civilizations have flowered and died here, as attested by the ruins of their engineering and construction works, but whereas Phœnician, Greeks, Egyptians, Romans and Arabs tried to live in this land, the American engineer has been interested only in helping to defeat a hostile army and push it back to its homeland on the European continent. With some exceptions, his construction achievements, therefore, while large in size are makeshift and temporary, and will hardly remain, even as ruins, for future generations to wonder at.

As one flies over this land or bounces across it in a jeep, thoughts such as this are bound to occur. Furthermore, the conclusion is unescapable that American construction

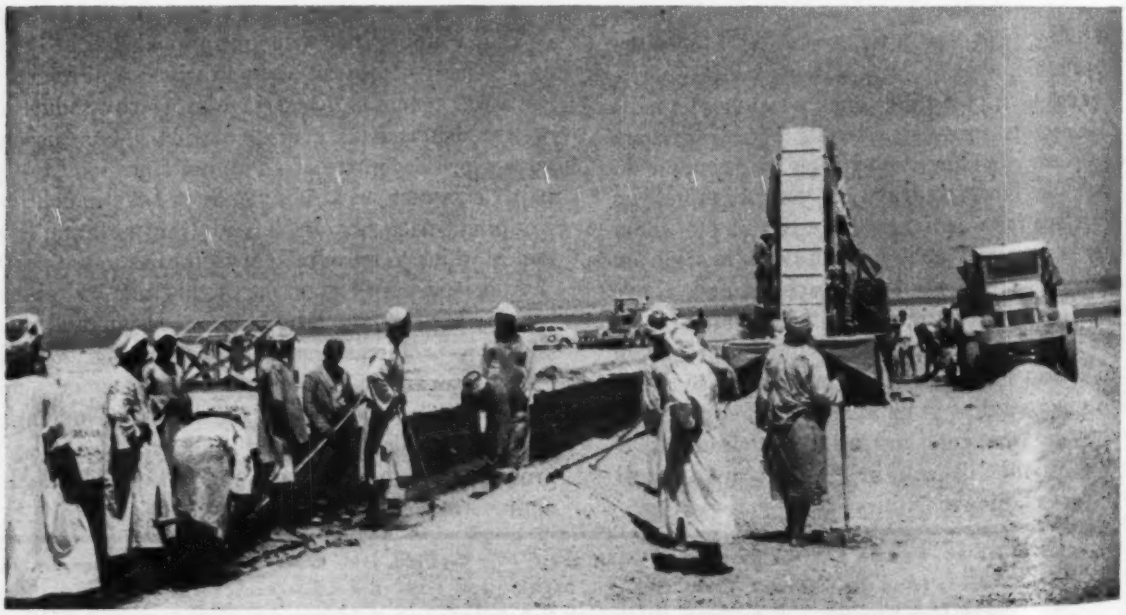


Fig. 1. Primitive and modern join hands in building a sand-asphalt runway on an American airfield in the Egyptian desert.

works in Africa, with the possible exception of the airfields of the Air Transport Command, already belong to history. The great August raids on the Ploesti oil refineries in Roumania and the Messerschmitt factories in Eastern Germany could well be the last major efforts to use Africa as a springboard; North Africa's future role in the war will in any event be minor. And as for the extensive contractor-built works in Eritrea, these never were called into use; failure of the Germans to penetrate the Caucasus and of Rommel to force the line at El Alamein made the Eritrean bases and shops largely unnecessary, and their cost of a good many millions of dollars merely a wise insurance investment.

But though the construction works in Africa no longer figure prominently in the war, they still retain considerable technical interest. Furthermore, now that the war has moved to Europe it is possible to reveal things about Africa activities that were hitherto restricted.

Traveling from Casablanca to Cairo, evidence of war construction is confined largely to camps, depots and airfields. This was a battleground, and no more was built than was necessary to support the troops. Every major airfield, however, is the scene of some kind of improvement or maintenance work. From the air a runway construction job looks like a county fair. Hundreds of Arabs mill about, there are tents of various hues under which they eat and rest at lunchtime, motor graders and rollers move along the strip, and jeeps painted in yellow and black checkerboard pattern dart around the desert.

Fig. 2. Prefabricated steel warehouse of American make is assembled by natives under supervision of an Engineer officer.

Closer inspection from the ground reveals that the work of the grader is confined largely to filling in the frequent shallow swales that cross the runway alignment; these fills are

Fig. 3. Desert repair station on an American construction job is established in a "blister" hangar previously used to service fighter planes. The ribs are 2 x 4's, the covering corrugated metal. The truck with the star is an Italian Fiat.

Fig. 4. Arab mortar making is an art that we don't try to improve upon. Sand and cement are mixed dry and pulled into a pile which is hollowed out and filled with water. As soon as moisture shows on the outside the pile is slowly broken down into the center, water being added as needed. Transportation is by a shoulder pan shown being filled at the right.

watered with a distributor truck and rolled. For the greater part of the runway area, however, it is necessary only to scrape off the blow sand and deposit a sand-asphalt mix; sometimes it is mixed with a blade grader or even by hand, while not infrequently a traveling bituminous plant is used.

The Arabs carry sand in baskets, spread it with hand shovels, and do a hundred things that could better be done with equipment if more of it were available. But one somehow is more impressed with how the Arabs look than with what they do; only conscious application of artistry and engineering could fasten together such rags and patches as they wear and keep them in place on a human body in motion.

Despite the relatively hard and smooth bituminous surface that is obtained on these desert airfields, the dust problem is still severe, blast from propellers causing every plane to be enveloped in a cloud of sand and small pebbles. The maintenance job on aircraft during the battle of North Africa must have been a tough one.

It is in Northern Egypt and in Eritrea in the Massawa-Asmara sector, however, that construction achievements are most marked. It was in these two areas that Johnson, Drake & Piper, under the supervision of American Army Engineers, undertook to build bases so that the Middle East could, if need be, support a tremendous war effort.

From the beginning, Colonel John N. Hodges has been in charge of all of this Middle East work, his present title being Chief, Construction Division, U. S. Army Forces in the Middle East. He was division engineer of the North Atlantic Division in New York, when the J.D.P. contract was let, and moved over here with a staff of Army Engineers early in 1942. Many of these are still here, as for

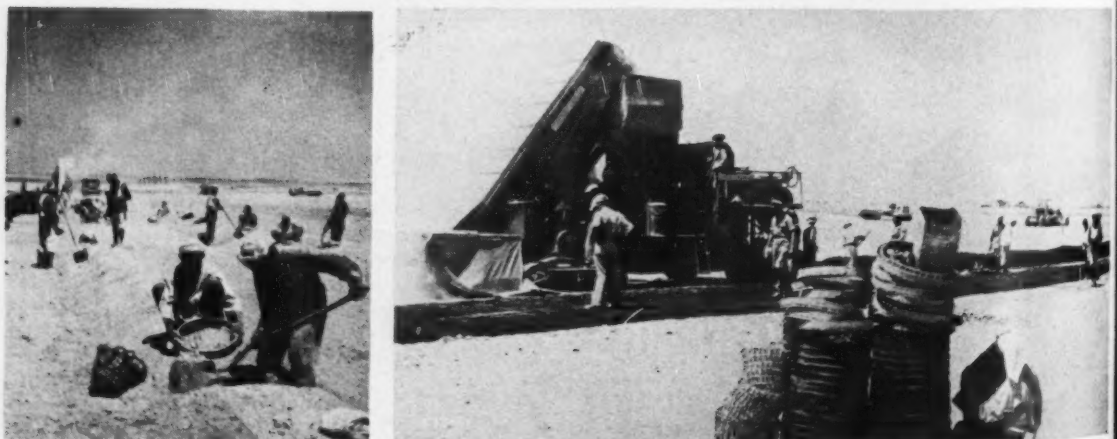


Fig. 5. Combining hand labor and machinery on sand-asphalt runway construction. Left, natives screen out large stones from windrow ahead of paver. Right, the paver picks up the sand, mixes it with asphalt furnished by a truck on the far side (see Fig. 1, also) and lays down the sand-asphalt mix.

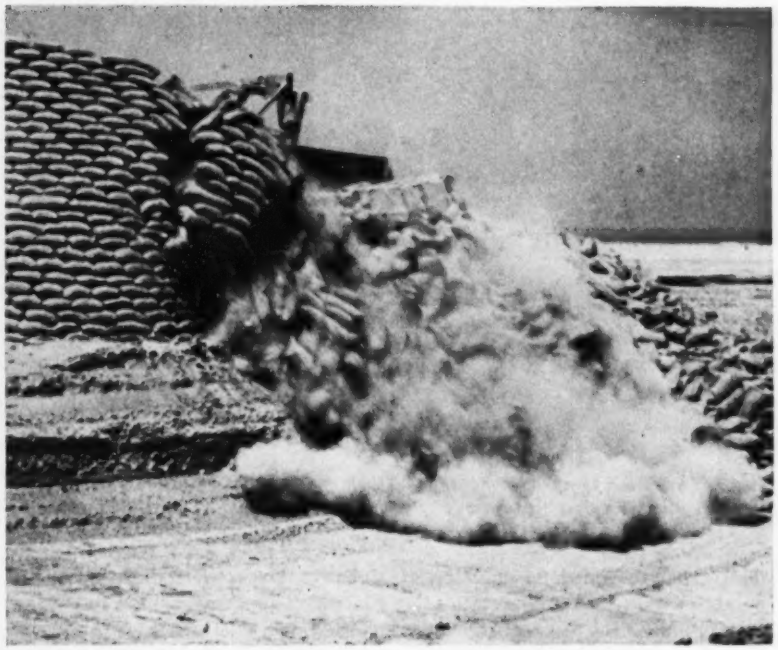
xample, Lt. Col. J. A. MacAlarney, hose last job in the States was put- ng Hartford's Park River in a con- uit, Major L. T. Weathers, Major mes E. Harper, Jr. and Captain orris B. Shumate. They are all lav- h with praise for JDP and the work accomplished under such men as obert P. Bayard, general manager, W. Gaussa, foreign manager, C. A. elson, Eritrean manager, E. J. Di ienzo, chief engineer, Pat Murphy, onstruction manager and Stanton avis, engineer for the North Egyp- an area. Since about April of this ear, when the JDP contract was ter- inated, construction in the Middle ast, which covers an area roughly om Benghazi to Baghdad, east and est, and from Palestine to Tangan- ika, north and south, has been an rmy Engineer show exclusively. But hether field work was under the con- ractor or the Engineers, it has been f similar character, which the fol- owing brief notes may succeed in escribing.

In Eritrea much of the work con- isted in rehabilitating Italian facili- ies damaged by British bombs and hells or wrecked by the Italians hemselves. Ports, airfields and de- pots were involved. But we also built many new buildings, roads, bridges nd military structures.

To get our heavy construction quipment from the docks on the Red ea up onto the mountain plateau, we uilt a road cutoff 3500 ft. long that liminated curves and grades in holesale manner. One large bridge nd five smaller ones bypassed nearly 0 miles of the old Italian road, a ine job of courageous relocation. he road we built consists of an 8-in. elford base, a filler of small stones nd a macadam wearing surface.

What looked like a find—a battery f gasoline storage tanks buried in he side of a mountain—turned out o be a dud. After rewelding all of he seams and installing new concrete ottoms, the tanks still leaked. The teel plate was too light to permit aking welds that would hold.

Buildings are of various kinds, rick and concrete block on steel rames, fiber board on wood frames. ll living quarters have porches about 0 ft. wide. One interesting job in- olved twelve Italian hangars, 107 x 72 ft. in plan and arranged in pairs 0 ft. apart. We roofed over the 30 t. spaces to make six larger hangars ach 244 ft. wide and 172 ft. long.



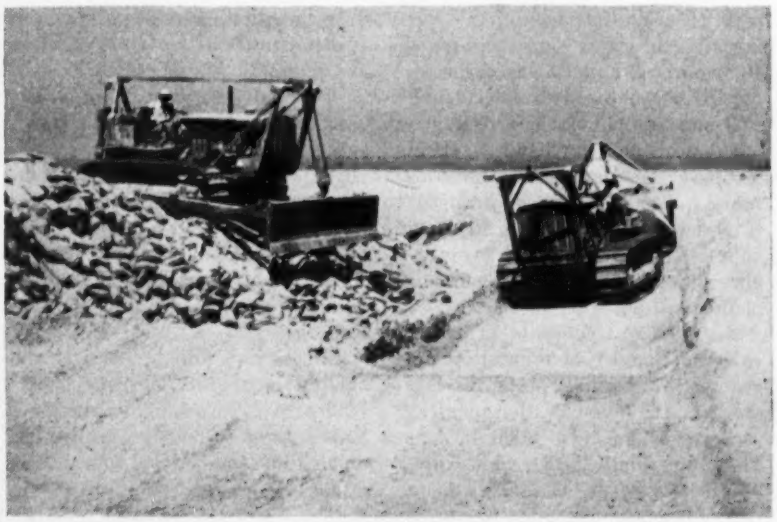


Fig. 6. Sandbag revetments around old fighter plane standings are buried where they fall, when pushed over by a bulldozer into a ditch prepared by a tractor-hauled 12-yd. scraper. A new runway will pass over the spot.

Most quickly erected buildings consisted of wood and steel frames enclosed in kraft paper and wire mesh, which was covered with shotcrete outside and inside. There were also many large industrial structures such as a plate shop 100 x 300 ft. equipped with 10-ton traveling cranes, reinforced concrete frame warehouses 100 x 250 ft. and many water distillation and cold storage and refrigeration plants. For enclosure material the Italians use a T-shaped concrete block which permits interlocking construction and has no straight-through joints. Our Engineers found it very useful. All of this building program is a monument to ingenuity, for many boat loads of supplies from the States failed to arrive, native labor was slow and undependable, and existing Italian structures had to be revamped for our use.

One water supply installation gave rise to a series of major construction problems. The supply was wells in the river bottom, and the distribution had to be from a 175,000 gal. reservoir on a mountain top. The pipeline connecting the two extended for 120,-

Fig. 7. Two steps in apron concreting. Truck mixers pass under aggregate plant and cement platform to be loaded and then back up to forms to turn over the mixed charge to the finishing gang, which resembles an Arab convention.

000 ft. and included the crossing of a ridge 450 ft. above the river. Because of the heat the line had to be buried, and the terrain was mostly rock. The solution was to hand-dig a 2-ft. trench using a labor force of 1000 natives, and camels for transporting the pipe and equipment. The well and pumphouse had also to be protected from river floods, and this involved constructing a rubble masonry wall 500 ft. long, 8 ft. high, 2 ft. wide at the top and 6 ft. at the bottom. The civilians and Army Engineers who pushed this job to completion will not soon forget it.

Airbase construction in Eritrea involved a number of interesting procedures. In the first place, the location was at a high elevation requiring runways as much as 8000 ft. long. They were built 150 ft. wide with a 3-in. sand-asphalt mat placed on the natural surface, a stratum of 8 to 24 in. of disintegrated granite and clay over a water-deposited loamy silt. But it was drainage that presented the principal problem because it was necessary to keep water away from this silty subgrade. This was accomplished by intercepting ditches along the high side of the runways. These ditches or drainage swales were made 20 ft. wide and 6 in. deep, and lined with 4 in. of asphalt-impregnated crushed rock. Drop inlets were placed every 500 ft., leading to box culverts under the runway that discharged the water far from the subgrade. The asphalt-impregnated crushed rock was also used for turning circles at the ends of the runways and at the dispersal points, locations where turning aircraft would have ruined a sand asphalt surface. The dispersal points incidentally were enclosed three sides with earth blast dikes having a core of earth-filled oil drums.

In Palestine where other U. S. construction work is located, conditions are quite different from Eritrea. This is flat country with gentle slopes covered with fruit and olive groves. The soil is a dark, rich alluvial deposit which undergoes large volume changes under wetting and drying. All building footings here were placed on sand cushions, and 3½ ft. wide concrete walks were laid around the buildings to aid in keeping the footings dry.

This swelling soil also caused drainage pipe trouble. After plain concrete pipe broke repeatedly, recourse was had to reinforced concrete pipe laid on an 8-in. sand bed and covered with 6 to 8 in. of said.

Desert airport building

One of the best examples of Army Engineer airport construction in the desert—because it is the latest and one of the largest—occurred this past summer. Indicative of the changed war situation in the Middle East, it involved enlargement of an existing and no-longer-used British fighter plane base into a passenger-freight terminal for the U. S. Air Transport Command. And reflecting the results of a year's accumulated experience, it combined American mechanized construction practices with native labor procedures for a new high in Middle East construction efficiency. Included were extensions totaling 1750 ft. to the 150 ft. wide runways, a concrete apron 200 x 1000 ft., new taxi tracks, three hangars, a half dozen warehouses, housing for 1500 officers and men, including mess halls and recreation buildings, an administration and passenger terminal building, a freight handling station and the necessary fueling and power facilities. The time schedule laid down and met was 60 days.

The most significant feature of the job was the way in which the various elements of work were divided between native hand labor and American construction machines. Thus on the housing, which was of brick, it was decided that nothing would be gained by attempting to supplement native practices with machinery; here as many as 100 masons and helpers were allowed to swarm over a building no more than 20 x 60 ft. in plan and build it in their own primitive way. On the hangars and warehouses, a crawler crane set the steel framing, but the prefabricated steel panels for walls and roofs were manhandled into place. Likewise the concrete floors for these buildings were poured from truck mixers operating from a central plant, while finishing was done by hand screeds and floats, a procedure that was also followed on the apron. Sand-asphalt runway surfaces were mixed in place with a traveling plant, but natives with hand screens and small baskets removed the large stones from the aggregate. Cut and fill construction, which on some previous jobs had been by hand labor and donkey or camel haulage, was intrusted to 12-yd. carrying scrapers pulled by crawler tractors. Considering the available labor supply, this combination of the construction

ods of 43 B.C. and 1943 A.D. ed to be as ideal as it was in- ting.

ke for example the runway con- tion. First operation was for a ol grader to windrow the natural rt sand and gravel. Natives were set to work with their circular sieves, removing all stones over t ¾ in. size; the sieves were ped into baskets which were car- beyond the runway and emptied. followed the bituminous mixer, of the newest and best of Amer- manufacture; its operator, as as the driver of the asphalt truck moved alongside and fed bitumen he mixer through hose, was an ineer soldier. More natives fol- d the mixer and raked those large es out of the mixed windrow of -asphalt that the aggregate sievers missed. Finally, the patrol grader ad the mixture, which was com- ed to its final 4-in. thickness with -ton roller captured from the ans. A good if not perfect surface lts, the possible imperfection ing in the continued existence of e large stones in the mix; should e be considered damaging to plane the runways will be covered with eet asphalt layer.

ome of the accompanying pictures captions tell the story of other esting phases of this job such as practice of disposing of sand-bag tments around old fighter plane ersal stations by digging a trench gside with a tractor-hauled per and pushing the sandbags in a bulldozer; of charging water, regate and cement into the truck ers at three different stations in central plant layout; and of re- ing and servicing trucks and pment under a flat arch corru- d iron "blister" hangar supported x 4 wood ribs.

ne operation, not pictured be- e it was not underway at the time other views were taken, was the formation of a steel tied-arch rican hangar into one with abut- ts. This hangar was designed to mmodate small fighter planes, greater vertical clearance was re- d for the huge transport ships must be serviced at this base. It therefore, decided to raise its onto abutments, which would the thrust that the original de- ers had intrusted to a steel tie buried beneath the floor. Holes he abutments were to be dug by a crawler crane clamshell, and the abutments, extending 9½ ft. above the desert and requiring 30 cu.yd. of concrete each, poured therein. The resulting structure should present an interesting appearance.

The other two hangars at the field are of Italian manufacture and consist of a central 35 ft. wide column-supported bay with 35 ft. wide cantilever bays either side. The ends are closed and the doors are hung on the cantilevers. Either the nose or the tail of a big ship can be run into these hangars as far as the central bay where the workshop machinery is located. They are efficient structures either from an erection or operation standpoint, as are most Italian facilities and equipment, a fact that has aided us time and again when American supplies were not available.

Stories of strange, amusing and sometimes instructive experiences drop into one's lap at Middle East Headquarters, where nearly everyone you meet has traveled the length and breadth of the theater at one time or another. For example:

In building an airfield in Arabia on the ferry route to India 430 tons of supplies were hauled 25 miles inland over mountain roads by a single caravan of 1100 camels.

On another Arabian airfield the runways were stabilized by gypsum obtained from the beach. Hauled to the site in 1½-yd. carts drawn by camels, it was spread by hand, sprinkled with concentrated brine and rolled. No regular roller being available on 8-ft. dia. steel pipe 6 ft. long was welded shut on the ends and filled with water. Drawn by two camels it did an effective compacting job.

Best workers in the Middle East are boys 12 to 14 years old. Able bodied men prefer to lie in the shade. The women will work, but we hire them sparingly because they are trouble-makers on a job.

At some locations equipment had to be unloaded from ships to native boats 2 or 3 miles offshore, and then manhandled onto the beach. Vital supplies were often lost. In one instance, when the continued existence of the job depended upon the successful unloading of a 10-ton water distillation plant, ingenuity was tested to the limit. A raft was fashioned from underground gasoline tanks, drums 10 ft. in dia and 30 ft. long, and the steel masts of the radio station, all lashed together with wire. The ship's tackle loaded the plant onto this raft successfully but the water inshore was too shallow to float it to the beach. The solution was a sand bag pier built into deep water over which the distillation plant was dragged and shoved to dry land.

Fig. 8. Native labor in Eritrea lays a telford base in a deep cut on a road that the American contractor built to improve transport communication between the docks and working areas in the mountains.

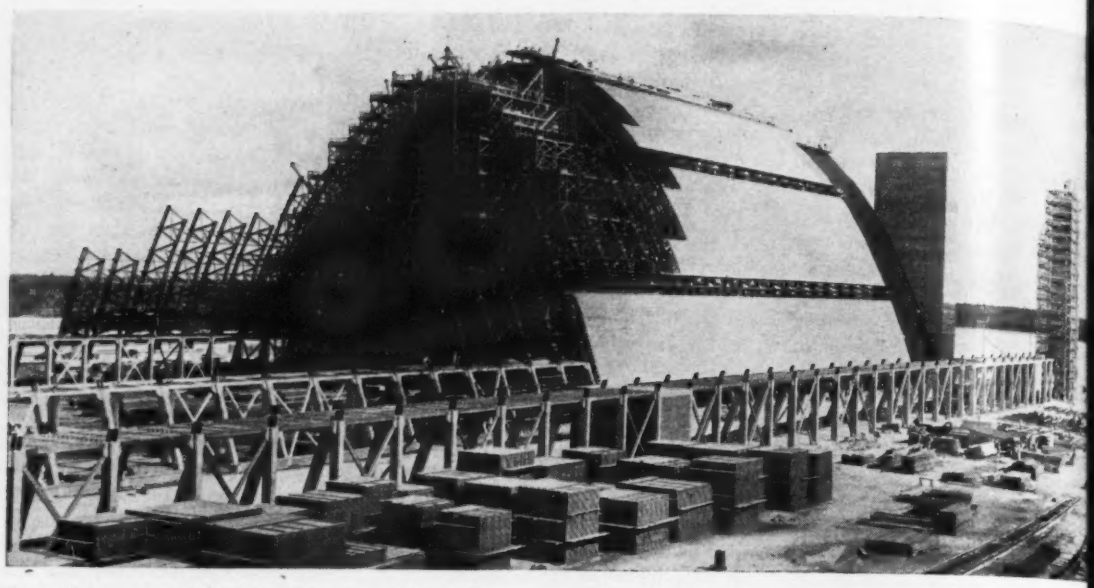


Fig. 1. Trusses at Station R were assembled on the ground and set in sections, working on several trusses simultaneous

Two Timber Blimp Docks Erected With Traveling Timber Scaffolds

***Contents in Brief**—Timber arches for blimp docks at two of the Navy's air stations were erected from large timber-framed travelers carrying derricks and other equipment used in assembly of the high roof arches. At one station, the lower ends of each arch truss were assembled on the ground and set in place by a derrick. From that point to the crown of the arch, each truss was assembled piece by piece from working platforms on the traveler. At the other stations, each truss was assembled complete on the ground and then was unbolted at some of the panel points to separate the truss into 16 sections which were carried to the dock and set in place by crawler cranes and derricks on the traveler.*

TIMBER FRAMED DOCKS of unprecedented size have been built recently or are now under construction at several points throughout the country to house Navy blimps. Details of the basic design for these docks were given in *ENR*, Oct. 22, 1942, p. 576, and the methods or erection employed at the old Naval Air Station at Lakehurst, N. J., and at one of the West Coast stations were described in the issue of April 22, p. 542, and Aug. 26. p. 320, respectively. At Lakehurst, timber arches with their connecting purlins, bracing and rafters were assembled in pairs on the ground in four units and were set in place with derricks mounted on high towers. On the West Coast, a scaffold mounted on flat cars was used for arch erection. At two other stations, which for military reasons shall be called Station H and Station R, traveling scaffolds also were used to build the dock but the methods employed in erecting the arch trusses differed quite radically from each other and from method used on the West Coast. There also were important differences in details of the travelers.

Dock erection at Station H

The dock at Station H is similar to the ones described in the articles noted above. It is 1,000 ft. long, 297 ft. wide and 171 ft. high to the crown of the arch at roof level. It diffe from those hangars in some detail A major difference is in the doo which instead of being rolling se ments supported by a deep beam ca ried on concrete pylons at the ends the dock, are timber-framed sem domes mounted on trucks to perm them to be rolled clear of the ope ings to anchor points at one side the hangar.

Another variation is found in t 25-ft. high concrete bents supporti the timber arches which, because th are carried on timber piles 65 to 75 long, are tied together across the ha gar by 1¾-in. steel rods laid ju under the floor in concrete box filled with a mixture of coal tar an sand to above the top of the roo These rods are equipped with turn buckles and are prestressed to 5,0 lb. per sq. in. A third difference in the size of some of the members the timber trusses which are ma heavier than those in the basic desig due to the high wind loads that m anticipated at the site.

Timber for the trusses came to th job all cut to size, including ho holes and chases for the ring co

rs, and treated with a salt solu- to make the trusses highly resist- o fire. Timber for the catwalks monitors was not received with imber for the trusses, hence the ion program was modified to it erection of the monitors and lks after the trusses were up.

Traveling scaffold adopted

ter reviewing various possible ods for erecting the trusses, C. G. el, project manager for the con- or, the W. Horace Williams Com- abandoned both partial and lete preassembly of trusses and ed on piece-by-piece erection a traveling scaffold. However, the scaffold had been built, at equest of his superintendent, Mr. el modified the plan to include sembly of the lower 75 ft. of truss on each side of the hangar, ing those sections with crawler s moving on mats over the soft nd outside the hangar. Experi- gained in erecting the hangar ated that the cost of this method about the same as the cost of -by-piece erection, making allow- for the fact that the contractor long-boom cranes available to set re assembled sections.

he character of the traveling scaf- is shown in Fig. 2. It was carried ardwood rollers which in turn supported on hardwood run r laid across sills on the bed of d shell that formed a base for concrete floor of the dock. The timbers were set accurately to line grade, a variation of only $\frac{1}{16}$ in. permitted.

he jacking method is illustrated in 3. It was simple, calling for no ual or expensive equipment, and d be made secure against move- of the scaffold under wind load. jack had a run of 18 in., after h the bucking blocks were moved ard. The 10-in. hardwood rollers kept accurately spaced by being d between guide timbers. The on each roller was 2,500 lb., or t 250 lb. per inch of roller length. e scaffold moved forward off the "dollies", jacking spuds were d between the bucking blocks he jacks to permit the roller dol- o be lifted out and moved to the end of the scaffold. When the ment had been completed, blocks dropped in between the scaffold the locking dogs to check any er movement.

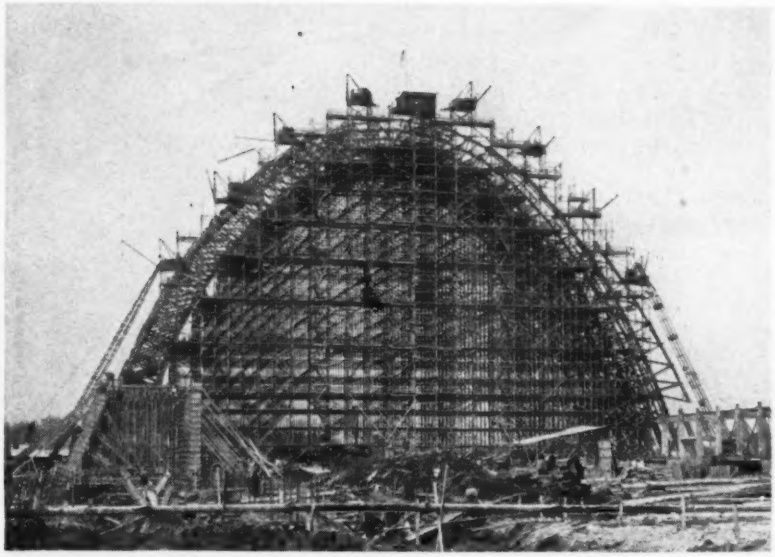
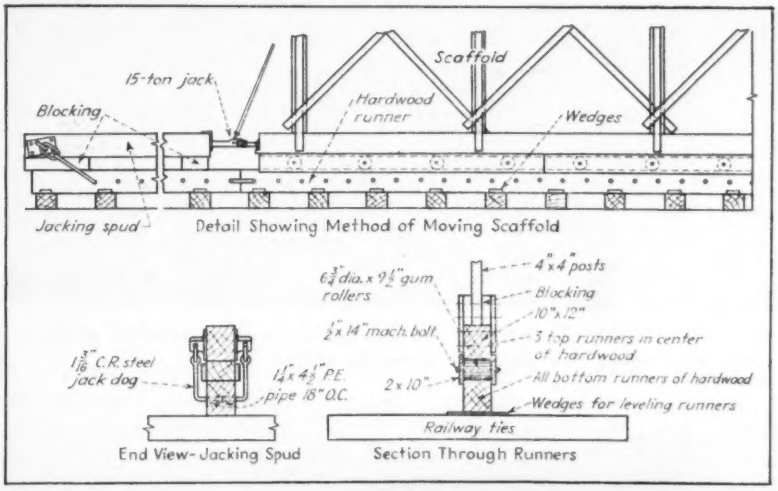


Fig. 2. The traveling scaffold at Station H was notable for the lightness of its framing. Only the lower 75 ft. of each truss was preassembled and set as a unit. The remainder was assembled piece by piece.



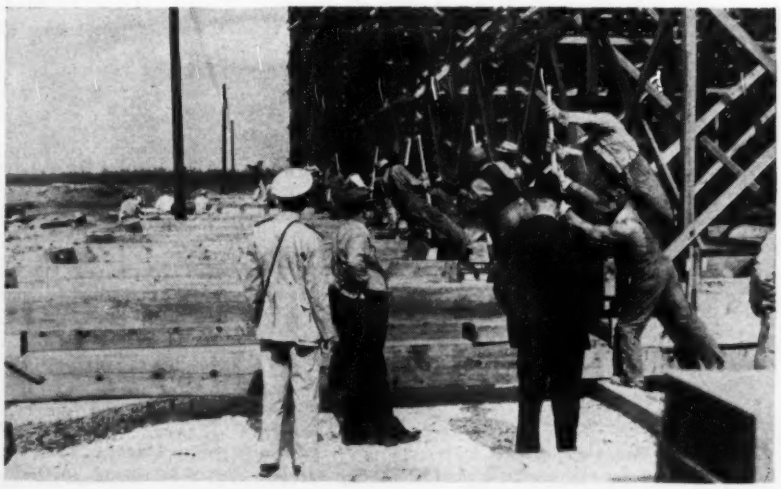


Fig. 3. Ordinary track jacks were used to move the scaffold at Station H, the scaffold moving forward on hardwood rollers between hard wood run-timbers. Details of the jacking arrangements are given in the drawing.

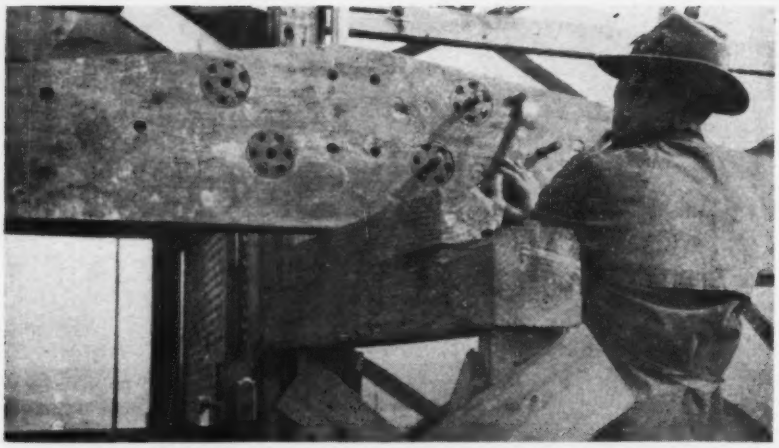


Fig. 4. Setting the splice at the top of a truss. Blocks on brackets on the scaffold (center) were used as templates against which to assemble the truss members.

Fig. 5. Men working on the trusses and bracing always had substantial platforms under them, though they were high above the ground.

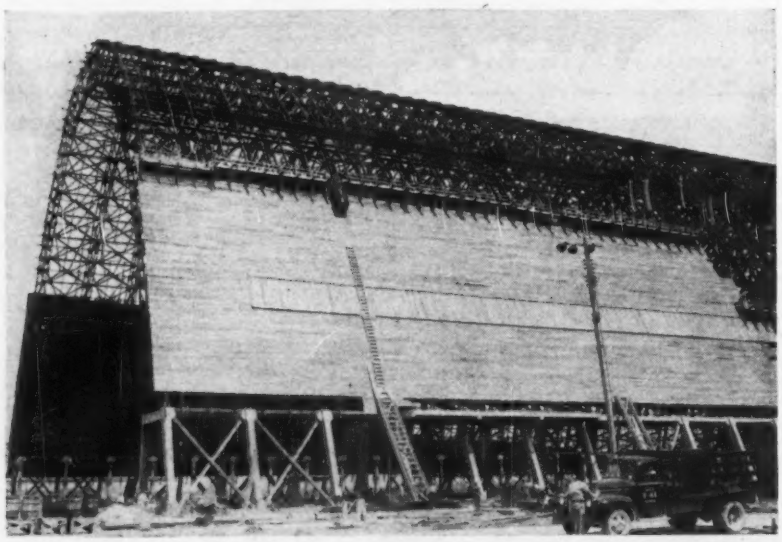


Fig. 6. Sheathing was applied from scaffolds raised with hand winches. Lumber was taken up to the scaffolds in the rolling carrier, shown in raised position at the left center, which was pulled up over the finished sheathing by a small hoist. Vertically sheathed strip shows location of future skylights. None are being installed at Station H at present.

The 20-ft. advance required only minutes, men operating the jacks being led by a "rhythm boss" to insure regularity and uniformity the jacking movement.

A lightly framed scaffold

The scaffold was 85 ft. long, 23 wide, 151 ft. high to the upper p form except at the forward end wh the platform was 130 ft. high. framing was bolted throughout a was notable for the lightness of members, no columns except those the elevator shaft being over 4x4 in size. Vertical bracing, except the elevator shaft, consisted of th 2x4's assembled as an H-beam. the elevator shafts, two 2x4's and 2x6 were used. Larger members w used for the horizontal bracing sy tem, being 3x12 in.

A high degree of rigidity w obtained by using short panel heig and by making diagonal bracing co tinuous in line across the whole sca fold, as shown in Fig. 2. This meth produced a considerable saving lumber over a scaffold formed of co ventionally braced towers. Spaci of the columns was varied across t scaffold to meet platform requir ments at the top. Platforms we formed with 2x6 or 2x8-in. jois depending on the load to be carri The scaffold required about 300,0 b. ft. of lumber.

When the scaffold was first erecte a fairly uniform thrust was requir at each jacking point, indicating th the loads were quite evenly distri uted; later, however, the scaffold to a permanent set making it necessa to have four men on each of the thr center jacks, two on the next fo jacks and only one man on the ou side jack.

An estimate of the time consume by mechanics in climbing to and fro working platforms on the scaffold i dicated that the installation of a gro sized passenger elevator would res in a large saving of time and wou more than offset the cost of the el vator. Consequently, a passenger el vator was installed in the forwa central section of the scaffold wi landings and runways at five levels the scaffold. Two stairways also we provided.

Air compressors for the derric and air-driven tools were mounte centrally at the rear of the scaffo opposite the elevator shaft. With th loading, wind reactions on the sc

old standing alone passed wells within the middle third of the base.

Forward bays of the scaffold rose above the level of the top of the trusses to facilitate the assembly of top members of the trusses. Other bays rose only to levels below the lower chord of the truss. There were working platforms under all panel points. All platforms and walkways were equipped with handrails.

Located on the platforms across the curved top of the forward section of the scaffold were eight stiff-leg derricks with 20-ft. booms so spaced as to serve all working platforms. Each derrick was equipped with a 1-ton single-line air hoist. Hand crabs were used to adjust the boom angle, and the booms were turned with a bull-stick.

Truss assembly

As noted previously, the forward panel length of the scaffold was higher than the remainder, extending above roof level. Brackets on the rear of this high section marked the panel points and served as a template against which each truss was assembled.

The first step in assembly of the arch trusses was to set the prefabricated 75-ft. sections (containing eight panel lengths) at the haunches of the arch. These were tied back to pile deadmen and were not released until the whole truss was in place. Meanwhile, workmen on platforms higher up began the piece-by-piece assembly of the remaining ten panels on each side of the arch, each crew being served by a derrick and by a ground crew delivering timber. Most small parts were taken up to the platforms on the passenger elevator. Wedges were used on the brackets to bring each panel point to its correct elevation, as determined by instruments from the ground.

Crews working on platforms below the truss in the hanger immediately put in enough braces and purlins to hold the new truss in position, and as soon as it was completely assembled, wedges were knocked from under the trusses at the panel posts and the tie-rods to the deadmen on the ground were released. The scaffold was then moved forward 20 ft. to permit start of work on the next truss. Completion of installation of the bracing system, purlins, and rafters as well as the electrical conduit systems was carried out by the crews on the platforms below truss level, the scaffolds being long enough to permit work on three full panels at all times.

Wind precautions

When the scaffold was first erected, as a precautionary measure, it was guyed against movement in either direction except during the working period of the day. During the time that the crews were working on truss erection, the forward guys were taken down as they interfered with the derricks. As the dock frame went up, the rear guys were transferred to it, the outer end being guyed in both directions. Nine $\frac{3}{8}$-in. wire cables were used for purpose, one at the center of the arch and four on each side.

The working program was based on completion of the arch rib, purlins, bracing and rafters for one 20-ft. section of the hangar each 8-hour day, using eight crews served by eight derricks. After the crews got organized, this record was bettered, the rate being raised to eight trusses in a 6-day week and finally to two per day.

Application of the two-inch sheathing to the hangar roof was carried on as an operation entirely separate from the erection of the truss framework. Lower runs of the sheathing were applied by carpenters working from small scaffolds bolted to the frame, but at the higher levels, triangular scaffolds on rollers were used. the scaffold being raised by scaffold winches anchored at the arch crown.

DOCK ERECTION AT STATION R

The docks at Station R are similar to the one at Lakehurst in that they have segmental vertical end doors carried by a deep beam supported on high concrete pylons instead of the half-dome doors at Station H.

Erection of the docks at Station R was by means of a traveler that is believed to be the first of such travelers to be built. The one at Station H and the one for the docks described in *ENR* Aug. 26, p. 320 were designed after the builders had had an opportunity to review the drawings for the traveler at Station R that had been built by the contractors, the Smith-Jacobs & Langston Co.

The traveler was mounted on 18 gondola cars set in pairs on nine standard-gage railroad tracks across the hangar. Movement of the traveler was attained by pinching the wheels of the cars along with standard car movers, as shown in Fig. 7.

Details of the traveler

The traveler was 81 ft. long, 212 ft. wide, and 151 ft. high, and required 480,000 b.ft. of lumber. Its weight produced an overload on the central cars 50 percent in excess of their rated capacity for railroad operation. Column members were 6x6-in. timbers with 2x6-inch ledges and diagonals. Connections throughout were made by split rings and bolting, with use of exterior, wood, lap plates or "scabs." On platforms at various elevations on the traveler were located 8 stiff-leg derricks with 35-ft. booms to raise and set in position twelve of the sixteen sections into which each truss was divided for erection purposes.

Two of the eight booms were located on the top landing of the traveler, one 12 ft. from the front of the traveler and one 35 ft. from the rear. The next two booms were located on the next lower landings on each side (136 ft. above floor level) and 23 ft. from the rear of the traveler. Progressively forward of the latter booms by 23-ft. intervals on the traveler were two booms on landings 107 ft. above the floor and two on landings at 86 ft. These two lowest booms were based 12 ft. from the forward edge of the traveler and in line, one on each side, with the forward boom on top.

Moving from bottom to top along three runways in the center of the forward face of the traveler was an exteriorly mounted elevator used to deliver supplies to the various platforms on the traveler. An interior stairway was used by workmen in ascending and descending from the platforms.

Hoist engines for the booms and elevator were located on the railroad cars on which the scaffolding was mounted and were operated by a remote-control bell system.

Timber sorted as received

Materials for all trusses and cross bracing were shipped to the job prefabricated, complete with all bolts and rings, being treated en route with a fire-resisting chemical. As the mater-

ial was unloaded from the cars, the various pieces were carefully stacked at locations in accord with a complete layout made for the lumber yard. Jigs were made for laying out three complete trusses at one time. Trusses were assembled on the jig so as to assure an exact fit prior to erection. Each truss was then unbolted at various panel points to form 16 sections which were carried separately to a point of erection by truck-mounted cranes.

Lower bents set by crane

The lower four of the sixteen sections into which each truss was divided were set directly on the concrete bents by the use of a crawler crane with a 95-ft. boom. The two base sections weighed 5½ tons each and were connected directly to the anchor plates at the top of the concrete bents. The two sections above the base sections weigh 1¾ tons each and reach to a height of 87 ft. above floor level. The longitudinal brace members between the sections of the trusses also were lifted into place by the crawler crane.

The remaining twelve sections of each truss were erected by use of the booms on the travelers. Since the traveler could not be moved beyond the door pocket, some shifting of the top booms was required for erecting the first two and last two trusses, but otherwise the derricks were used in the positions previously outlined.

Each of the two lower booms hoisted six truss sections up and over the edge of the traveler. The weights of these sections varied from 1¼ tons to 1½ tons. Four of these fixed truss sections were passed upward and backward on each side to the booms next higher in elevation, but the last two were set in place atop the two sections previously set by the crawler cranes. Of the four truss sections passed up by each of the lower booms to the booms next in elevation, two were passed similarly upward and backward to each of the two booms on the third platform, and two were retained and connected to each of the top ends of a second partially completed truss, the top sections of which had been set by the lower booms prior to the last movement of the traveler. Similarly, each of the booms on the third platform set in place two truss sections on a third partially completed truss, the last section of which had been set by the booms on the second landing before the last movement of the traveler.

Work on four trusses

As the above described operation was in progress, the forward boom at the top of the traveler hoisted two 1¼-ton crown sections of the truss directly to the top landing and passed them to the top boom at the rear which set them in place, thereby completing a fourth truss. The lowest sections of this fourth truss had been set by the lower booms at previous stages in the journey of the traveler.

Following the truss sections, and in similar manner, the struts, purlins and longitudinal bracing (which had been connected on the ground) were hoisted and set in place by the booms. Rafters, roof sheathing, skylight frames, bolts, and other supplies were delivered to the various platforms by the elevator, assisted by the forward booms.

All work done from traveler

While the truss sections and bracing were being connected, other crews working from the traveler and from inside the trusses, simultaneously connected the rafters and nailed on the 2-in. roof sheathing over the truss sections immediately after they were connected. At the same time, still other crews, making use of the traveler, were installing the catwalks, overhead monorail beams, skylight frames and electrical fixtures.

After completion of the cycle of operations just described, the traveler was moved ahead 20 ft., the move requiring 20 minutes, and the cycle was repeated. This kept a crew of thirty men almost constantly engaged picking up the track behind the traveler and laying additional sections ahead.

Roofing laid from scaffolds

Aside from application of the roofing paper and the installation of glass skylights, no work remained to be done on the dock roof after the traveler had passed. The roofing

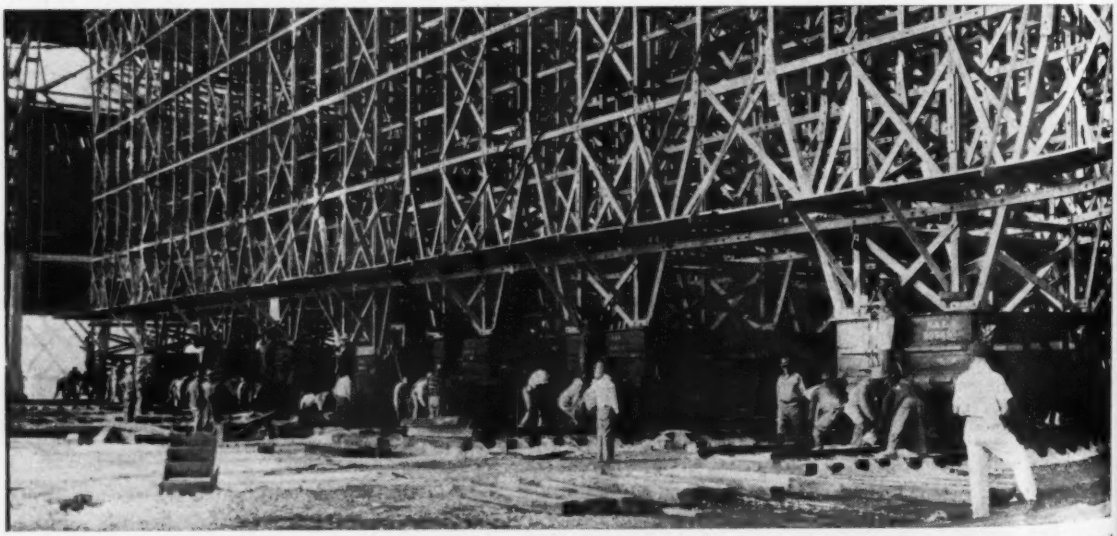


Fig. 7. The scaffold at Station R was mounted on 18 gondola cars. Car movers were used to pinch the car wheels forward when the scaffold was advanced to a new position. Men on the car brakes and others with wheel chocks stood ready to check too great a movement.

aper was applied to the sheathing rom the outside by the use of sus-ended scaffolds that rolled on wheels long the exterior surface of the dock. Other crews working on the ground llowed the traveler in construction f the offices, shops and concrete oors.

Safety precautions

Despite the use of carpenters at eights comparable to that of steel ork, not a single accident of any ajor importance occurred during e erection of the docks. This is be-ved to have been due in part to e selection of men on the basis of bility to work at great heights. Rail-gs were provided around all land-gs on the traveler, and a horn, in-nded to signal the stopping of all echanical equipment used on the ection job, was installed on the aveler but never had to be used.

Protection against fire on the trav-er was provided by water barrels at e various landings and by the con-uous employment of a fire warden. ire fighting equipment also was ailable on the ground.

To insure the traveler against roll-g as a result of wind pressure, rail amps were applied to the track at e desired stopping points, and dur-g the movement of the scaffold, two en were assigned to each track to and ready to insert chock-blocks in ont of the car wheels.

Since the connection of bracing and plication of roof sheathing pro-essed simultaneously with the erec-on of the trusses, there was little nger of damage to partially erected usses from high winds. However, as extra precaution, incompleted ork was securely guyed.

Rate of progress

Work on the roof and 51 arches of e first dock was completed in 51 ys, or an average of a truss, with eathing and other details, per day. uring the erection of the second lf of the dock, after delays due the late arrival of some erection uipment, the average number of ches completed in a day was 1½, ith a maximum 2½ in a day. This ection speed meant one complete uss with all attachments, or 55,000 ft. of lumber, erected in 4 hr. and min. Even better progress is anti-pated in construction of other docks, rticularly in view of the fact that different design of door pocket will permit passage of travelers through the end openings, thus making it unnecessary to shift the position of the upper derricks to erect the end trusses.

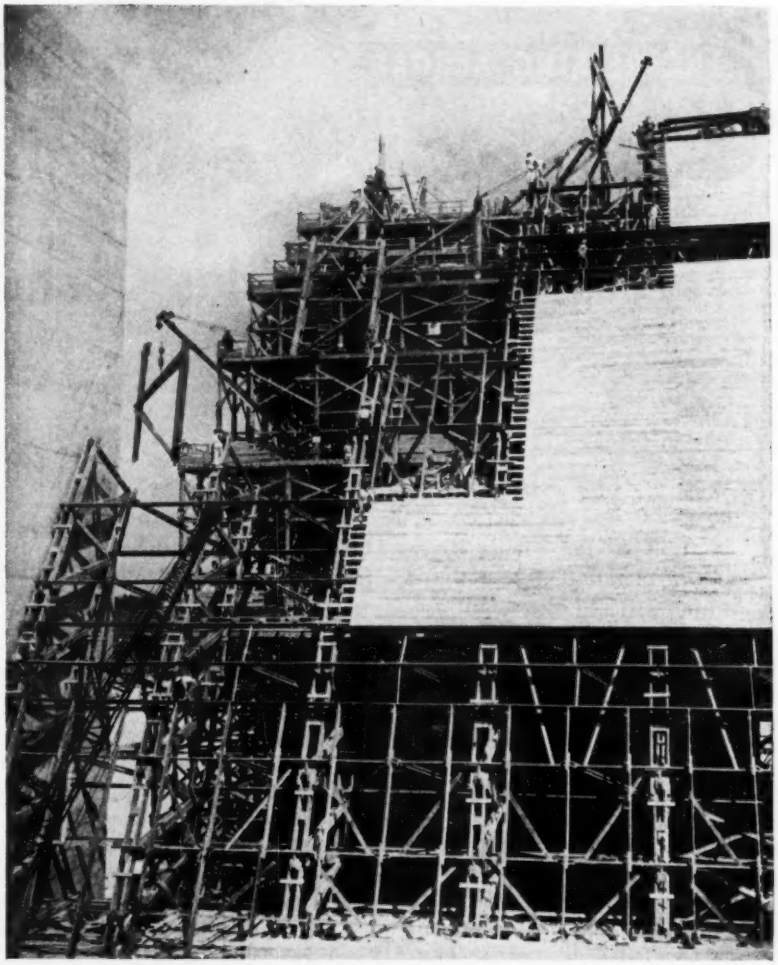


Fig. 8. Work was carried forward on several trusses at one time on Station R, and the sheathing was kept close to truss erection so that all operations were completed before the traveler moved from under any one panel of the roof.

The contractors ascribe the rapid construction of the dock and the general success of the erection procedure, primarily, to the fact that the procedure and type of traveler used permitted the working of many separate crews of men simultaneously at different points on the dock. Further, they believe that the working of each crew or group of crews on a specific phase of dock erection greatly increased efficiency and made reaction to organizational efforts almost spontaneous.

Design and construction of the docks is under the cognizance of the Bureau of Yards and Docks, U. S. Navy, headed by Rear Admiral Ben Moreell (CEC) USN, chief of the bureau. At Station H, Lt. Comdr. H. W. Hillyard (CEC) USNR, was officer in charge of construction for the Navy, and at Station R. Lt. Comdr. E. W. Southworth (CEC) USNR, was officer in charge of construction.

At Station H, the prime contractor was the W. Horace Williams Co., for which C. G. Cappel, partner, was project manager. At Station R the prime contractors were Smith-Jacobs & Langston Co., a joint venture of Ivy H. Smith Co., S. S. Jacobs Co., and the Langston Construction Co. P. B. Burkhalter was project manager.

All of the prefabricated timber for the docks was supplied by Timber Structures, Inc. Enroute to the jobs, the lumber was pressure treated with a mixture of ammonium and boron to make it as nearly flameproof as possible.

ENGINEERING ABROAD AS SEEN BY ENR EDITORS

Hydro-Plant Doubles Costa Rican Power

A. N. Carter
Assistant Editor, Engineering News-Record

● **Now under construction in Costa Rica is that country's largest hydro-electric power development and the fourth to be built on the Virilla River. The new station will have an initial installation of 5,000 kw. and ultimately 10,000 kw., which will add nearly 50 percent to the output of that stream, the country's present chief source of electric power. American construction machinery and methods are being used and most of the plant equipment came from this country. Local labor was taught modern construction practices.**

A HYDRO-ELECTRIC POWER PROJECT that will add 50 percent to the water power output of Costa Rica is to be completed this year. It is located on the Virilla River, about 25 miles from San Jose. The initial installation will be 5,000 kw.; an additional 5,000 kw. is to be installed when the load demands it. At present Costa Rica has a total of 18,000 kw. of hydro-electric capacity and a few small steam and diesel generating stations.

The $1,750,000 project now under construction is the largest power development between Mexico and Panama. It is being built by the Compania Nacional de Fuerza y Luz, San Jose, Costa Rica, a subsidiary of American & Foreign Power Co., New York City. This undertaking is the company's fourth development on the Virilla River. About five miles upstream from the present development there is a 3,000-kw. project; three miles farther upstream is a 4,500-kw. plant, and still another three miles upstream is a 3,000-kw. installation.

Cutting through a very hilly region, the Virilla River has a rapid fall of about 150 ft. per mile. At the site of the work now under way a minimum flow of 420 cfs. is available, and the probable maximum is estimated at many times greater.

Based upon six to seven years of study, the new project was started in June, 1941. It consists of a diversion dam, an open intake flume 240 ft. long leading to a tunnel 8,700 ft. long, a large surge tank, two 5-ft. dia. steel penstocks 800 ft. in length and a powerhouse that ultimately will contain four 2,500-kw. generating units.

The dam is a low structure about 200 ft. long, of mass concrete founded on a firm limestone. It consists chiefly of an ogee spillway section 100 ft. long and 30 ft. above the foundation and an adjoining section about 30 ft. long with its crest 3 ft. higher. The lower section, which is expected to confine the normal overflow to the center of the channel, may be raised by flashboards. Only minor storage above the dam will be possible.

Built into the dam at the north end is a 10x12-ft. vertical sluice gate for flushing trash past the dam. For removal of heavier debris and floating logs above the dam, a guy derrick, purchased second hand in the United States, is mounted on the abutment above the trash sluice. It has an 85-ft. boom and is operated by an electrically driven air winch.

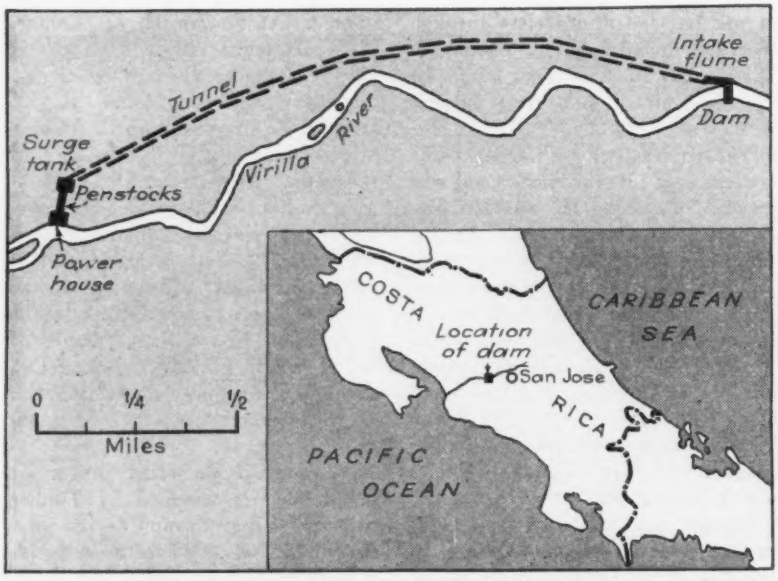


Fig. 1. Population of Costa Rica is concentrated in central part of the country, and the Virilla River development will meet increasing power needs in that area.

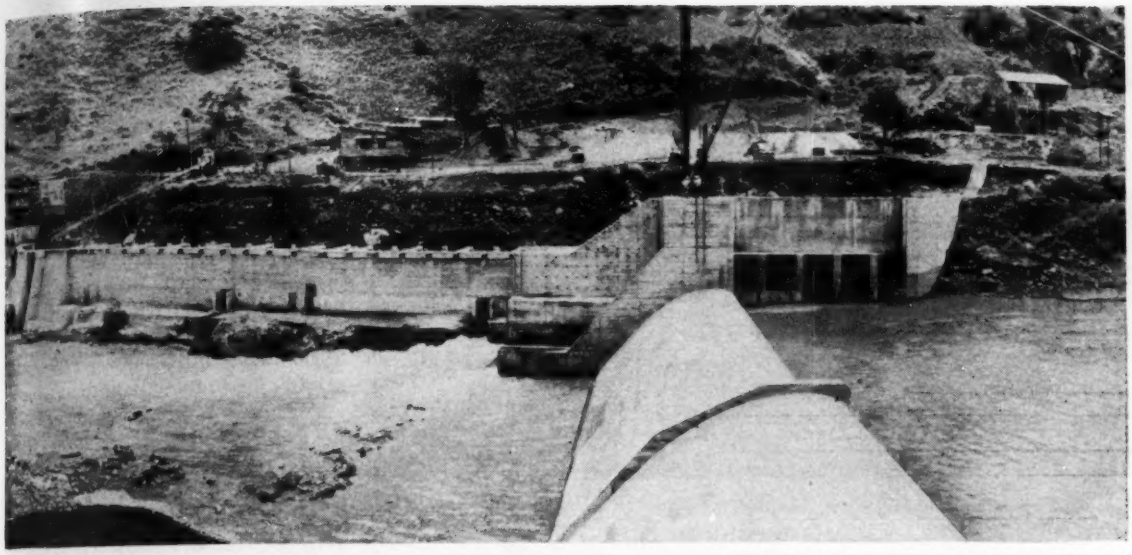


Fig. 2. The normal flow of the Virilla River is diverted by this low dam through the five 9x9-ft. openings on the far side and is carried by flume, tunnel and penstocks to a power plant nearly two miles downstream. The lower section of the dam is to be equipped with flashboards.

Cement and steel for the dam were purchased in the United States. The coarse aggregate was produced at the dam by crushing the excellent andesite rock quarried high on the north abutment. Sand was obtained from the Pacific Ocean, being shipped to a railroad siding a few miles away for delivery to the job by truck. Concrete was mixed in two 1-yd. portable mixers set high enough on the north bank to permit concrete to be delivered to the dam by chute.

Flow to the power plant will be through an intake immediately above the dam consisting of five 9x9-ft. openings controlled by vertical steel gates fabricated locally. The gates are protected by vertical trash bars made of old railroad rail. From these gates a heavily reinforced concrete flume 16 ft. wide, 10 ft. deep and 240-ft. long leads to the tunnel portal. Two silt chambers are built into the flume's lower end, with sluices for discharging silt back into the stream below the dam. Flow to the tunnel is through a set of fine screens.

The tunnel penetrates volcanic andesite for the greater part of its length of 8,700 ft. It is to be concrete lined throughout, of modified horseshoe section, and of 8-ft. minimum diameter. The grade in the first third is 0.5 percent, increasing to 0.6 percent for the remaining two-thirds of its length. It was built from six faces, one at each end and two from each of two auxilliary drifts.

Lining of the tunnel is now in progress, requiring 12,000 cu.yd. of concrete. Concrete for the lining is placed pneumatically using a half-yard placer served by half-yard mixer, both electrically driven units that move through the tunnel as the work progresses. Aggregates and cement are delivered together in half-yard light-railway cars that are moved in by hand at a rate of about one car every three minutes. This makes it possible to place the concrete for a 60-ft. section in 7 or 8 hours.

The first lining operation is to build a curb at each side of the tunnel floor to serve as a base for the side forms. The 60-ft. section of steel forms is then moved to place on buggies mounted on the track and is set on the curbs while concrete is forced in through a 6-in. pipe at a pressure of 100 psi. In 8 to 10 hours the forms can be lowered and moved ahead, thus making it possible to complete a 60-ft. section in each working day. After the arch section of the tunnel has been lined, the railroad track will be removed and the invert built.

A reinforced-concrete surge tank 25 ft. in dia. and 70 ft. high has been

Fig. 3. Aggregate for the dam was prepared by this American-made crusher. The plant was being assembled when this picture was taken.

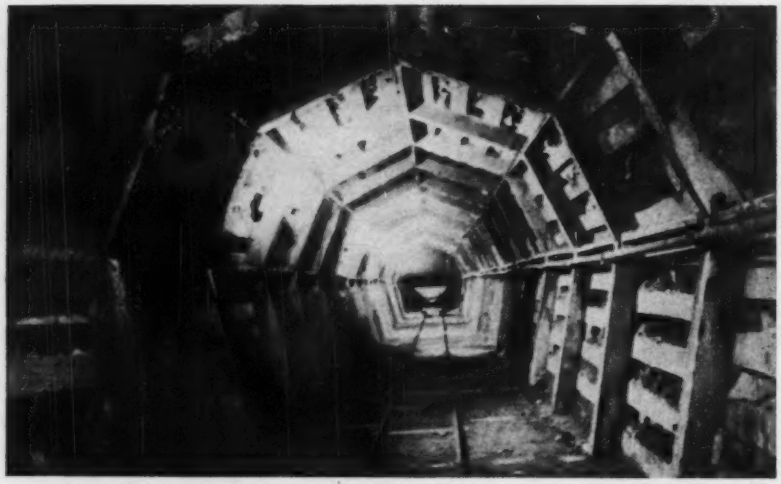


Fig. 4. Supporting timbers were required for 3,700 ft. of the tunnel, the lining being placed to embed the timber supports.

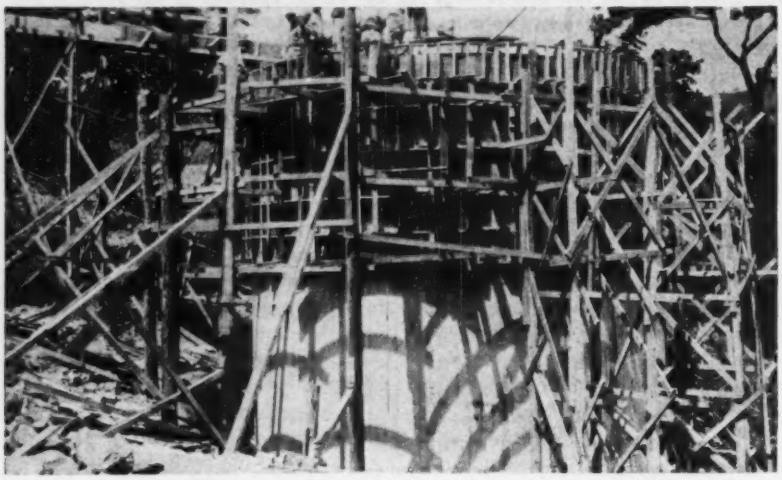


Fig. 5. At the downstream end of the tunnel a reinforced-concrete surge tank 25 ft. in dia. and 70 ft. high was built with slip forms.

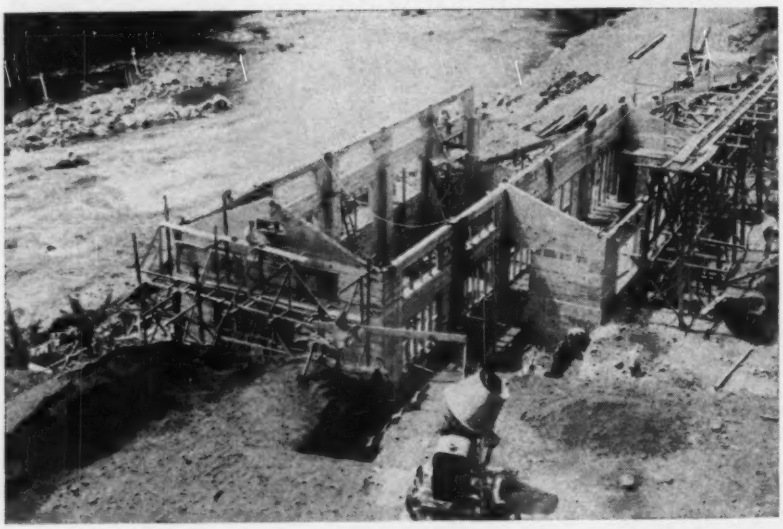


Fig. 6. Both the walls and roof of the powerhouse are to be reinforced concrete, the roof slab to be waterproofed with tar and surfaced with native tile.

built at the downstream end of the tunnel. Slip forms of the type shown by an accompanying photograph were used for this work.

Installation of the two 5-ft. dia. steel penstocks about 800 ft. long to join the tunnel and the powerhouse has not been started but the concrete supports are in place. The penstocks descend to the powerhouse on a 25-percent slope where each will branch out to deliver water to two horizontal Francis turbines. These turbines drive 2,500-kw., three-phase, 60-cycle, 4,160-v. generators. Both the turbines and generators are manufactured in the United States.

The total head utilized is 310 ft. and the net head with two turbines operating will be 293 ft. and 271 ft. with four units in operation. Under normal maximum load each turbine will use 136 cfs. of water.

At present only two of the four generators are to be installed; the other units will be added when power demands increase sufficiently to warrant the installation. Since the date of delivery of the other units is indefinite, the powerhouse has been constructed only sufficiently large for two units. That structure is of reinforced-concrete. It has 12-in. walls and a 3-in. roof, which is covered with two coats of tar and tile manufactured locally.

The voltage is stepped up at an outdoor substation to 33,000 v. for transmission. The transmission line that is to deliver power from the plant to connect with the lines of the other Virilla River projects, a distance of seven miles, was built as one of the early operations. This plan permitted the line to be used to bring in power to operate the construction equipment and light the tunnel during its construction. The transmission towers are unusual, consisting of pairs of old 50-lb., 30-ft. rails set in concrete.

The location work and preparation of preliminary plans were under the direction of A. S. Gehrels, general manager of Compania Nacional de Fuerza y Luz in San Jose, with the assistance of local engineers.

The detailed drawings and design were made by Ebasco International Corp., New York, under the direction of L. A. Whitsit, hydraulic engineer.

Local labor trained as to modern construction practices is used. These workers do good work. On the tunnel excavation they set an excellent safety record.

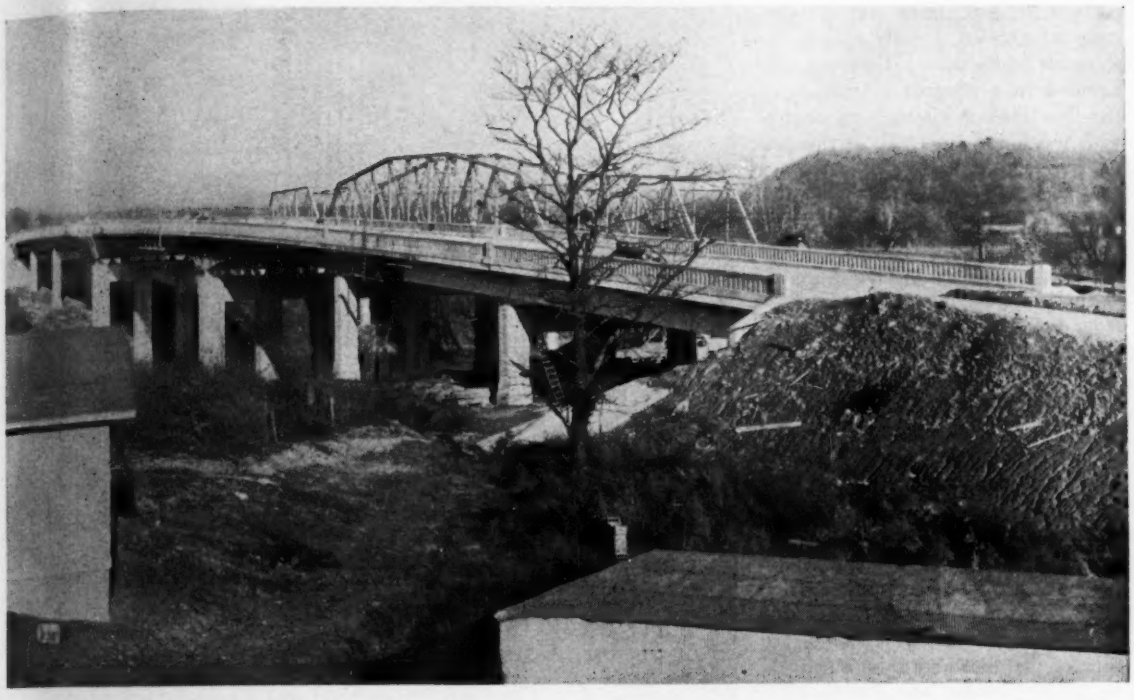


Fig. 1. Improvement of Dixie Highway in Kentucky required construction of a 7-span plate-girder bridge over Salt River.

New Bridges on the Dixie Highway

***Contents in Brief**—Improvement of 28 miles of the Dixie Highway north of Fort Knox required two bridges of interest because of the construction procedures followed. One crossing is a 7-span plate-girder bridge over the Salt River. The other is a 630-ft. reinforced-concrete, slab-and-girder overpass spanning the intersection of two railroads.*

ERECTION PROBLEMS of interest were presented in the construction last year of two road bridges on the widened Dixie Highway between Louisville and Munfordville, Ky. The improved road required the elimination of two bottlenecks, one a narrow steel-truss structure over Salt River north of West Point, Ky., and the other the street route through that town. In the second case a by-pass around the town solved the problem, but this by-pass required the building of an overpass exactly at the intersection at an acute angle of two railways. At the Salt River location a new wide bridge was constructed (Fig. 1). Both structures are unusually wide for rural road bridges, having decks of 55-ft., over-all width.

The larger of the two bridges is the Salt River crossing, which consists of seven plate-girder spans on concrete piers and abutments. There are seven lines of plate girders across the deck which provides for a 48-ft. roadway and two 3½-ft. widewalks of concrete. The span arrangement is shown in Fig. 3; two simple spans at each end flank a central, three-span continuous-girder unit 472 ft. long. The four piers supporting the continuous girder unit are carried on steel H-piles. The simple-span piers and abutments have precast concrete pile foundations. All piers consist of three shafts rising from a continuous footing and connected at the tops by portal girders, as shown by Fig. 2. Only the two tall river piers presented any considerable construction tasks.

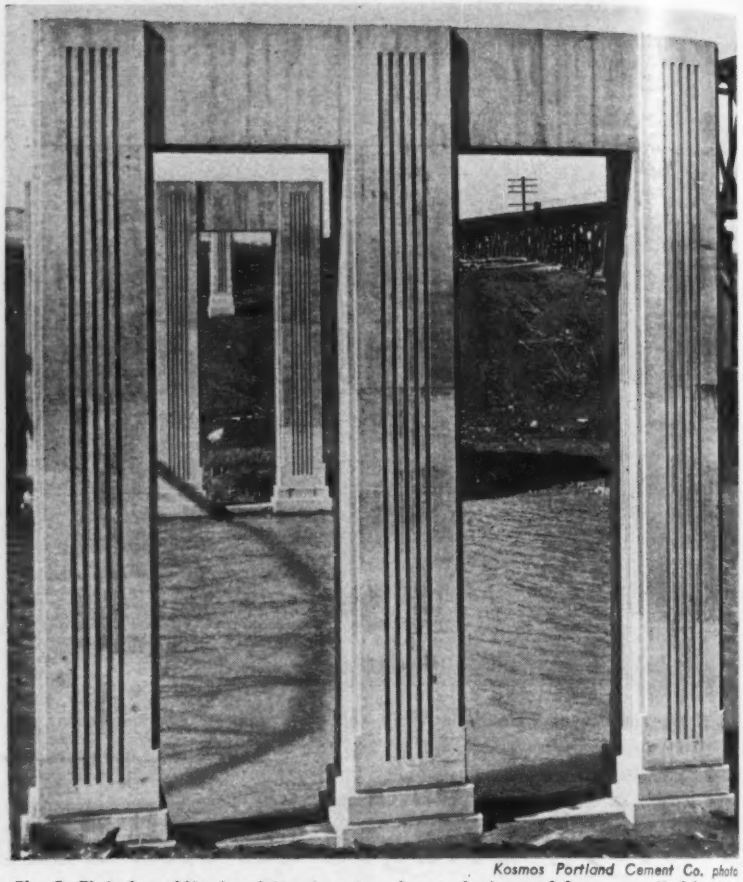
At the river-pier locations hard shale formations capable of supporting the pier loads are about 90 ft. below water level and the water is about 25 ft. deep. Each pier foundation consisted of 200 steel H-piles, 70 ft., long and of 12-in., 53-lb. section, driven inside a 30x60-ft. steel sheetpile cofferdam. The cofferdams were made the planned size of the concrete seal course pile capping, with the sheeting driven to 15 ft. below the planned bottom of the seal course and the top extending several feet above water level. The interior bracing was arranged so that the foundation piles properly spotted could be driven through it.

A clamshell excavated the bottom of the cofferdam to a depth sufficiently below the planned seal course to allow for the natural earth upheaval due to pile-driving. The piles were driven with an enclosed, double-acting hammer that stayed with the pile to its full underwater depth. The design load for each pile was 50 tons, but driving to near refusal in the shale gave a bearing capacity of 75 to 115 tons.

The seal courses in the two main

piers were 7 ft. thick and the concrete was placed directly against the sheetpile cofferdam. Concrete was handled in a covered bottom-dump, two-line bucket lowered to contact with the foundation soil, or the previously placed concrete, and then slowly opened. After the seal slabs had hardened the cofferdams were pumped out and the remainder of the concrete was placed in the dry.

The two river piers are 90 ft. high from top of slab to the bridge seat and each contains 1,600 cu.yd. of concrete. All concrete for the bridge was mixed by two 27E single-drum pavers located on land and serviced by dry-batch trucks. For the river piers a floating derrick was able to swing the buckets from the mixers to the point of placement. When the piers were completed the sheeting was pulled by this same floating rig; there was some difficulty in loosening the steel from the concrete but none of the piles had to be burnt off.



Kosmos Portland Cement Co. photo

Fig. 2. Fluted architectural treatment and use of plywood forms resulted in piers of pleasing appearance for the Salt River bridge.

Traveling derrick erects steel

The steel, as indicated by Fig. 3, was brought to the bridge site on barges. Erection was begun at Pier N1. Here, as shown by Figs. 3 and 4, a falsework bent of eight H-piles was erected by the floating derrick. On this falsework and pier top an 80-ton stiffleg derrick was assembled on a gantry-like framework or "saddle" that raised the derrick (Fig. 4) high enough above the pier top to permit girders N1 to be lifted from the barge and swung endwise through the saddle onto the pier. This operation required that while the girders were being set they be swung longitudinally along the bridge for 11 ft. by a ratchet, as the derrick could not be located to place them in position by itself. The girders each weighed 42 tons and they were balanced over the pier with the river end resting on the falsework bent.

After the river ends of the girders were tied down to the bent, the traveler, lowered to the girders, moved landward to Position 2 of Fig. 3 to set the steel for the 136-ft. section of the continuous girder in Span 5. From this position it unloaded the girders for the spans over land and swung them inshore to temporary storage. The derrick next continued landward to erect the girders for the two simple spans at the north end.

While this latter work was in progress the floating derrick moved the eight-pile falsework bent to the other side of the main channel. Turning around and traveling back across the structure, the 80-ton derrick was spotted at Position 6 in Fig. 3 to lift into place the 100-ft. sections for the middle of the central span. The outer ends of these sections were supported on the falsework bent in its new position. The traveler next moved to a position above the falsework bent and erected the 100-ft.

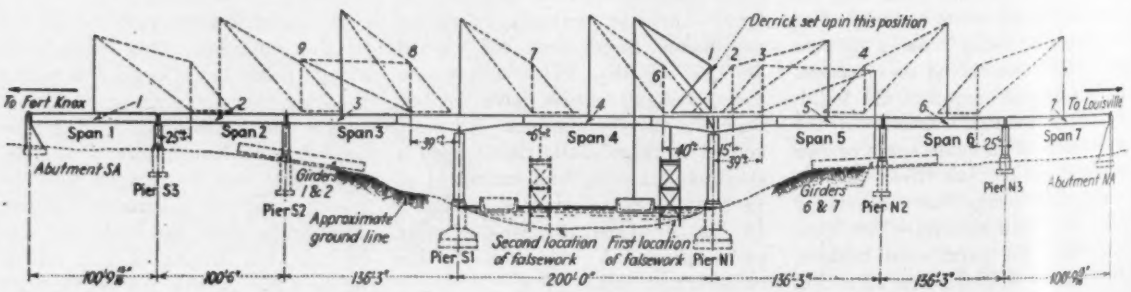


Fig. 3. Erection of the Salt River bridge superstructure was accomplished with an 80-ton travelling derrick following the sequence of operations shown above.

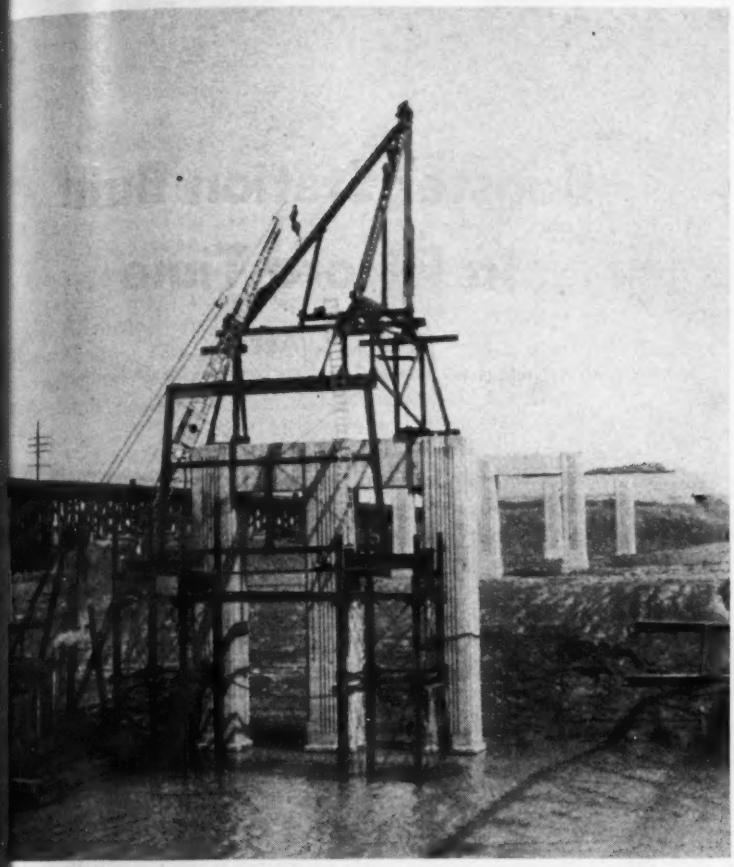


Fig. 4. Steel erection for the Salt River bridge started with a derrick boat erecting an eight-pile falsework bent near Pier N1 and then setting an 80-ton erection traveler on a saddle on that pier. This derrick then erected the seven lines of girders for the full length of the bridge.

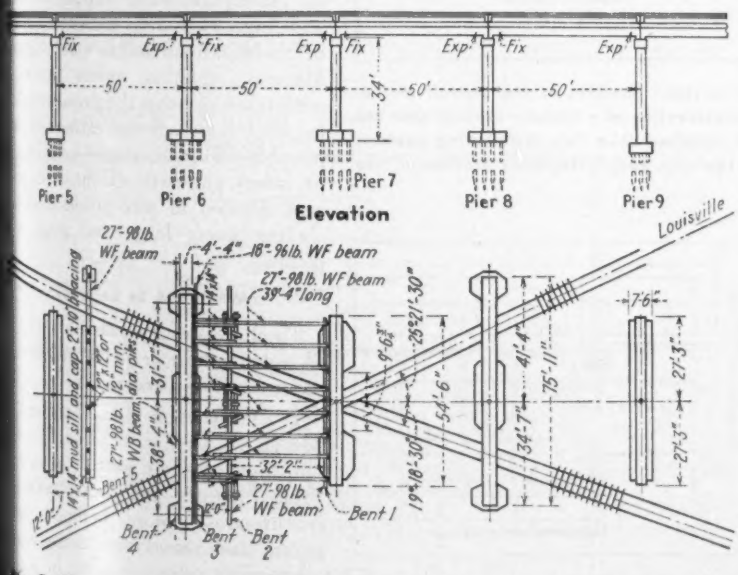


Fig. 5. Pier arrangement where the two railroad tracks were crossed simultaneously by the West Point overpass. In the lower left of the drawing is illustrated the falsework employed in building the deck, which is 55-ft. over-all width. No interruptions to rail traffic occurred during construction of the bridge.

sections required over Pier S1, and then continued landward to complete the erection work in the south end spans.

Steel erection for the Salt River bridge required about four months.

Overpass at track intersection

Except that it was built over an intersection of two railway tracks the West Point overpass was of the usual reinforced concrete slab and girder deck construction on concrete piers on precast concrete piles. It has four 50-ft. spans flanked at each end by five 43-ft. spans and is on a vertical curve with maximum grades of 4 percent. The total length is 630 ft. Fig. 5 shows the pier and falsework arrangement at the intersection which permitted free train movement during construction. Work was advanced from both ends leaving the spans over the tracks to be closed last.

Engineers and contractors

The work described was carried out for the Kentucky Department of Highways, T. H. Cutler, chief engineer; G. L. Logan, director of construction; H. R. Creal, bridge engineer; E. L. Lyons, district engineer at Elizabethtown and F. A. Shobe, district engineer at Louisville. Mack Galbreath, senior highway engineer, represented the Public Roads Administration.

On the Salt River bridge project, Ryan Construction Co., Evansville, Ind., built the foundations and Mt. Vernon Bridge Co., Mt. Vernon, Ohio, fabricated the steel and built the superstructure. The West Point overpass was built by Ruby Lumber Co., Madisonville, Ky.

Blasting Caps and Safety

Manufacturers of explosives have made available for distribution, free of charge, a poster suitable for display on bulletin boards and leaflets warning of the danger from blasting caps. Warnings against allowing blasting caps to fall into the hands of children are included in literature placed in each box of caps but it is desired to emphasize directly to the children the danger of handling caps.

Material may be secured from The Institute of Makers of Explosives, 103 Park Ave., New York, N. Y.

Booster Station Built In Record Time

Louis E. Ayres
Ayres, Lewis, Norris & May, Consulting Engineers, Ann Arbor, Mich.

UNUSUAL SPEED was achieved in the design and construction of a large waterworks booster station recently completed in Detroit. Ground was broken for the project June 1, and 41 days later two of the four 40-mgd. pumping units required were ready for operation. The entire $600,000 project, consisting of a pumping station, a reservoir intake and about one mile of large main, was substantially complete August 17.

The project was carried out as an emergency measure to meet anticipated peak demands for water in the northern portions of the Detroit Metropolitan area. The so-called High Pressure area involved is supplied with water from two distributing centers, Water Works Park on the east side of Detroit and the Springwells Station on the west side. The distance by feeder mains, roughly in the arc of a circle, from Water Works Park to Springwells is about 18 miles.

Studies completed early in May 1943 by engineers of the War Production Board disclosed the possibility that the increased water demand and the inadequate outlets from the Springwells Station might result in an inadequate water supply in July and August for many industries north of Six-Mile Road and in Oakland and Macomb counties, unless measures were taken to boost the pressures during peak hours. It was estimated that possibly 100 plants could be affected, or about one-sixth of those in this area devoted to war production, including many large and vital war plants.

Fig. 1. Increased water pressures in the northern portions of the Detroit metropolitan area were made possible by the construction of a booster station near the eastern edge of Highland Park. Water is obtained from two distributing centers, Water Works Park on the east side of the city and Springwells Station on the west side.

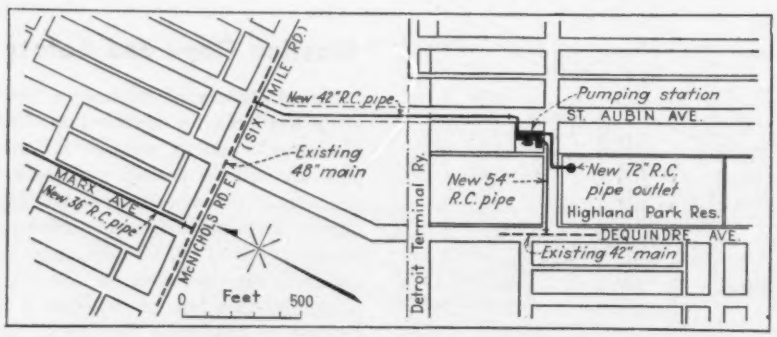


Fig. 2. By means of the new station, an existing 40,000,000-gal. reservoir owned by the city of Highland Park is filled at night from the Detroit system and the water pumped back into the distribution mains during the afternoons and evenings, when water demands are greater.

What had to be done

To eliminate this possible shortage of water, extensive construction was required. The work included:

1. Construction of the booster station shown by Fig. 4, which in addition to housing the four 40-mgd. centrifugal pumps and their 2,000-hp. synchronous motors, complete with piping and valves and surge connections, also provides, in a separate wing space for a primary switch house and, in another wing space for the chlorinating equipment

nd field laboratory and offices.

2. Construction of a 72-in. reinforced-concrete suction line 365 ft. long from an intake structure in the reservoir to the pump suctions; and 360 ft. of 54-in. and 1,180 ft. of 42-in. reinforced-concrete pump outlets; and 2,950 ft. of 36-in. distribution main.

3. The cleaning of the existing reservoir, which is 1,360 ft. long by 281 ft. wide by 15 ft. deep, by sand blasting, sweeping and washing with heavily chlorinated water.

Location of the new booster station is about midway between the Water Works Park and Springwells distributing centers. Fortunately, at this location a 40,000,000-gal. open reservoir, owned by the city of Highland Park and used for raw water storage, was available. The plan now inaugurated utilizes this reservoir for filtered water storage. The reservoir is filled at night from the Detroit system and the water is pumped back during afternoons and evenings into the distribution mains of the High Pressure Area.

Job started in a hurry

Application covering the project was prepared May 15, 1943; approved by the regional office of the Federal Works Agency May 18, by the Washington office May 19, and by President Roosevelt May 21. The contract for engineering services was dated May 21, and negotiated contracts covering the general construction and the electrical work were signed May 28. The pumping station was staked out May 28, when the construction sheds were started. Rain then interfered for a day, but on June 1 a dragline moved onto the job and ground was broken that afternoon. June 11 the foundations for the first unit were poured, and June 20 the first pump was being erected.

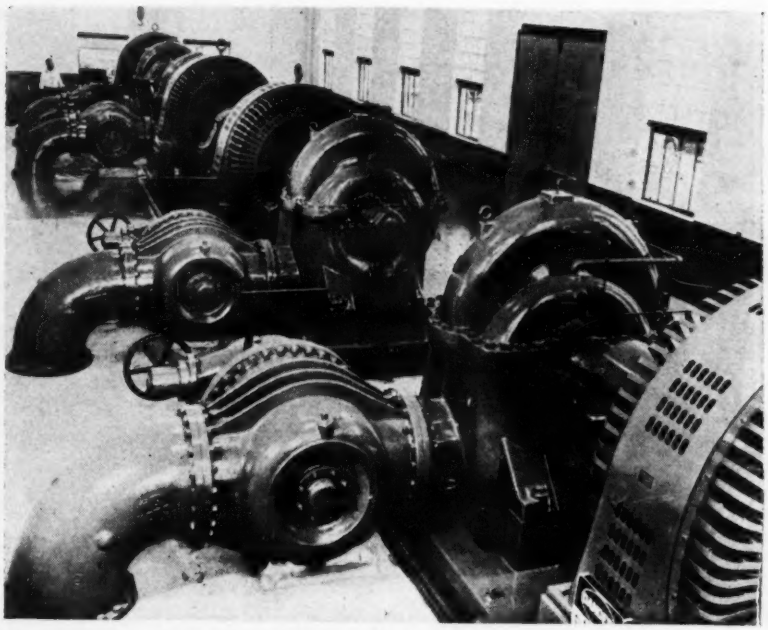
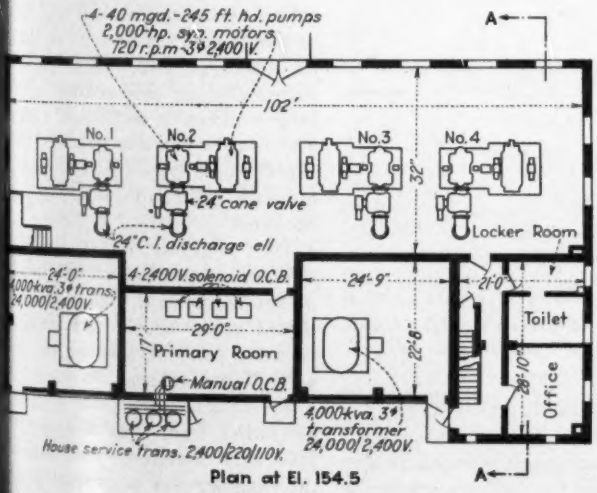


Fig. 3. Interior view of completed station showing four 40-mgd. pumps leased from City of Philadelphia. Two units were ready to operate six weeks after construction started and the two other units eight weeks after work was begun.

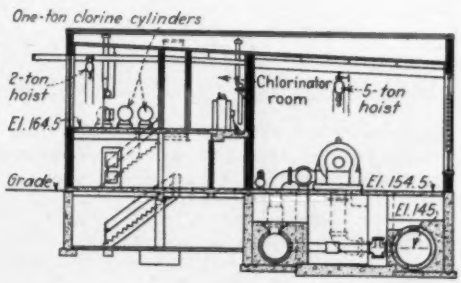
Two units ready in six weeks

By July 12, or just under six weeks after breaking ground, two of the four units were ready to operate. They were complete with suction and discharge piping and electric power. Also, one chlorinator and one ammoniator had been installed. Four days later one unit went into service; and by July 28 all four units were ready to operate, although under temporary sheds. By July 31 the second outlet to the north, a 42-in. dia. pipe, had been chlorinated and placed in service. During the first two weeks in August the 36-in. extension into the distribution system was laid, substantially completing the project.

Greater progress would have been possible but for the lack of common labor. On June 6 the payroll, including supervision and job office help, totaled only 27 men. Not until June 14 did a night shift start. The total payroll on that date was only 68 workers during the day and 37 at night. About this time the job was



Plan at El. 154.5



Section A-A

g. 4. In addition to housing four 40-mgd. pumps and their 2,000-hp. synchronous motors, the booster station provides a primary switch house and space for chlorinating equipment, field laboratory and offices.

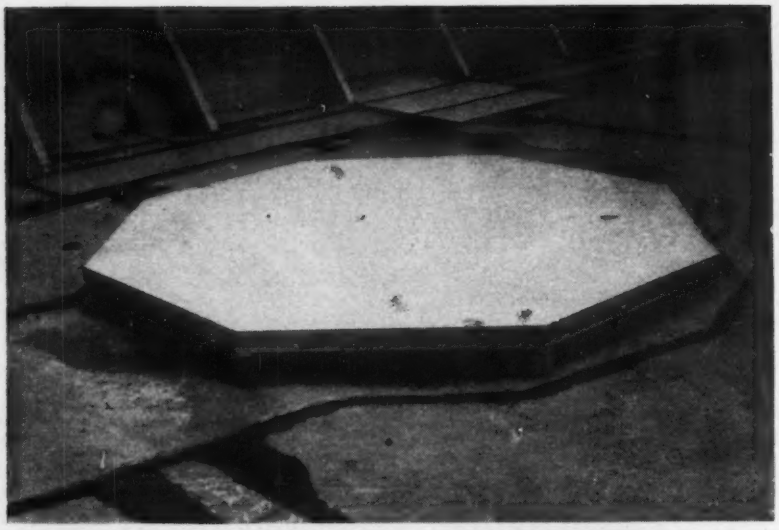


Fig. 5. Built above the floor of the existing Highland Park reservoir is a plate of reinforced concrete against which the incoming water impinges when the reservoir is being filled.

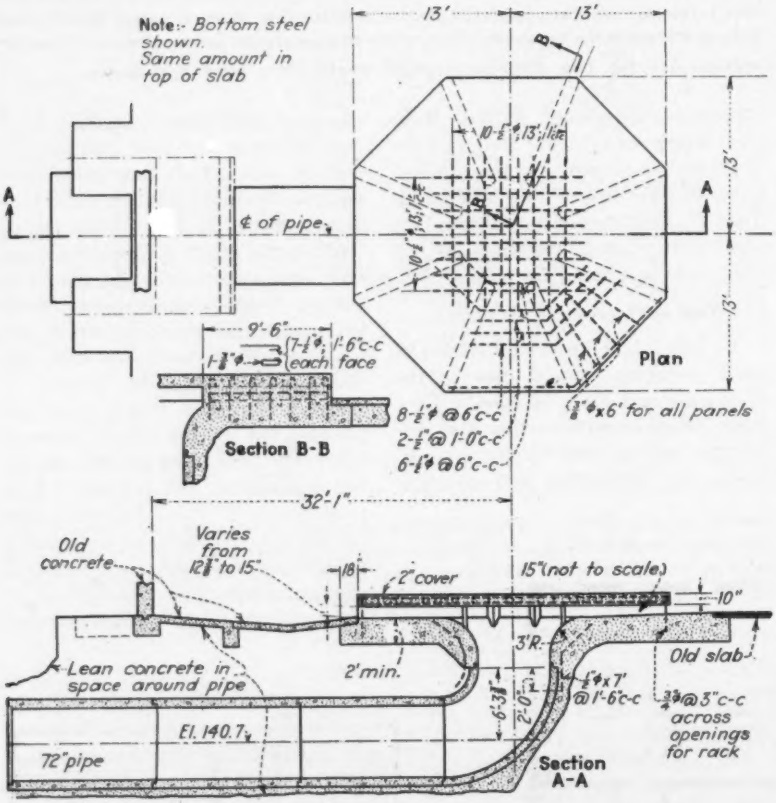


Fig. 6. To permit water to be withdrawn from reservoir at a high rate without causing a vortex, the plate over the discharge pipe is supported on eight radial walls. A rack is provided across the openings by ¾-in. rods at 3-in. centers.

declared the number one emergency project in the area, with the result that June 16 the day payroll was increased to 97 and the night shift to 47. During the night of June 21 the work was closed down on the advice of the Detroit Police Department because of the race riots then occurring. Although temporarily affected by this condition, the payroll was gradually increased to 144 on the day shift of July 7, but to only 46 on the night shift. It was never possible to create an effective night force.

Immediately following approval of the application, the Federal Works Agency, with the assistance of the War Production Board, made a wide search to locate suitable equipment and materials. The plant was designed and built around what was available. The four 40-mgd. centrifugal pumps with motors were leased from the city of Philadelphia, and five 24-in. cone valves and two 16-in. pressure relief valves were located in the East. Much of the remaining equipment, including several large gate valves, considerable reinforced-concrete pipe, and most of the electrical equipment were available in the Detroit area. The balance was obtained promptly through special directives from the War Production Board.

Orders were placed by wire and telephone as soon as suitable equipment was located; much of the material was on hand within three weeks after work started. In the meantime, plans went forward, incorporating the available equipment; and the structural details were supplied to the contractors from day to day but in time to avoid construction delays. Despite this rush procedure, no major adjustments or structural changes were required in the field.

Cast iron pipe for connections

Cast iron pipe was used to make the pump connections to the reinforced-concrete suction and discharge lines. Both leaded and flanged joints were used. Steel nipples, welded to the steel shell of the concrete pipe, were leaded into the bells of the 30-in. valves on the suction side and bolted to the flanged connections of the 24-in. discharge pipe. Little play was permissible in this setting, so that large and heavy sections of concrete pipe were required to be placed rather exactly, both as to line and grade, to meet the inlet and outlet pump connections.

The reservoir intake, or outlet structure, depending on the direction of flow is shown in Fig. 5. It was designed as an inverted jet impinging on a flat plate when filling the reservoir. Water entering or leaving the reservoir under the plate is directed by radial walls, which support the plate and eliminate swirl. Intent of the designer was to provide a structure, with a minimum of disturbance to the reservoir floor, permitting the

water to be withdrawn from the reservoir at relatively high rates without causing a vortex when the water is relatively shallow over the intake.

Discharge from the reservoir at the rate of 160 mgd. is considered possible, which corresponds to an average velocity of about 9 ft. per sec. in the 72-in. outlet pipe.

Pumps increase pressure greatly

The new pumps are rated at a higher head than that needed in their present setting. At their rated head they will produce a 105-psi. pressure, and they discharge into a system where a 35-lb. pressure has been common for years. It has been estimated that to meet the peak requirements pressures as high as 75 lb. at the pumps may be necessary. The adjustment between pump pressure and desired distribution pressure is now accomplished by throttling the cone valve. Later, after more data have been obtained on distribution system losses and desirable pressures in relation to pumpage rates, the impellers of some of the pumps may be cut to fit the operating requirements. These changes would practically eliminate the need for throttling.

The cone valves are manually controlled, as automatic equipment was not available in time to be installed this season. Such equipment may be added later. At present, in case of a power outage, there would be a reversal of flow through the pump and a reversal of rotation of the unit until the cone valve could be closed by hand. Although this condition is undesirable, no injury to the equipment is expected from reverse rotation.

Water treated before being stored

Present operating procedure is to add both chlorine and ammonia to the water as it enters the reservoir. The ammonia appears to hold the chlorine residual so well that further chlorination is not needed when the water is again pumped into the distribution system.

The Federal Works Agency secured the rights to use the Highland Park reservoir and plant site, and have leased the entire project to the Detroit Department of Water Supply for operation for the duration of the emergency.

Those in charge

The work was carried out under the direction of the Federal Works Agency, Maj. Gen. Philip B. Fleming, administrator, and Baird Snyder, assistant administrator, L. A. Gillett, regional director, R. D. McGill, regional engineer, and D. M. Hatch, state engineer, the latter being in direct charge in Detroit. J. A. Utley, Detroit, was the general contractor, and the Gray Electric Co., Detroit, did the electrical work. Ayres, Lewis, Norris & May, consulting engineers, Ann Arbor, Mich., prepared the plans and specifications, and supervised construction.

The rush construction could not have been completed within the time required without the complete cooperation of the Detroit Edison Co.

Submarine Main Laid With Floating Rig

Pipe for a 12-in. dia. submarine water supply main beneath the Ashley River at Charleston, S. C., was laid at a rapid rate with the two barges shown in the accompanying photograph. The line extends to Saint Andrews Parish. At some points the main was 35 ft. below the water surface.

The 16-ft. pipe sections were joined with ball and socket joints of a type that permitted a deflection of 15 deg. at each joint. As the sections were joined by means of a gantry supported between the two barges, the floating rig was pulled forward to permit the pipe to slide into place along a "ladder" supported below the gantry between the barges. The ladder consisted of a timber-frame chute covered by sheet metal and equipped with angles at the edges to facilitate movement of the pipe into the water. The section of pipe shown extending above the ladder in the accompanying picture is equipped with a special bulkhead used when operations were shut down at the end of the day or when bad weather required that operations be halted and the floating equipment moved into shore. In such cases the bulkhead was added to prevent salt water from entering the pipe. When the bulkhead was added a buoy was attached to the last section laid to aid in locating the pipeline when work was resumed.

Total length of the $34,000 project was 2,100 ft. Charleston Constructors, Inc., was the general contractor and John McCrady Co. as engineers represented the Saint Andrews Parish Fire and Water District. James E. Gibson is general manager of the water department at Charleston.

Charleston News-Courier Photo

Pipe for a water main beneath the Ashley River was placed by means of a chute supported between two barges.

Fig. 1. More than** 2 **miles of** 36-in. **prestressed concrete** pressure pipe be**ing installed to serve** a **new war plant in Chicago.

New Method Used to Make Prestressed Concrete Pipe

***Contents in Brief**—Designed to withstand an hydraulic pressure of 200 psi., several hundred feet of 36-in. diameter, wire-wound, prestressed concrete pipe was used in Chicago recently in constructing a feeder main to a new war plant. The pipe was centrifugally cast in 12-ft. lengths, several innovations being introduced in its manufacture. The pipe was laid at a considerable saving in cost over concrete-encased steel shell pipe.*

CAPABLE OF FURNISHING a 10 mgd. water supply for a new war production plant, 36-in. dia., wire-wound, prestressed concrete pressure pipe was laid recently in Chicago at a considerable saving in cost over concrete-encased steel shell pipe. Designed to withstand an hydraulic pressure of 200 lb. per sq. in., this feeder main was cast in 12-ft. lengths to provide a total of 11,244 ft. of pipe.

As this type of concrete pipe was comparatively new in the field of high-pressure water pipe, several innovations were introduced in its manufacture. The inner shell of 3-in. concrete was centrifugally cast in a steel form that had one longitudinal joint bolted together. Cast steel rotating rings were fitted on each end of the form and the insides of the rings were beveled to provide a short taper at the ends of the pipe. Prestressing of the concrete shell was secured by inserting eighteen $1\frac{5}{8}$-in. longitudinal rods through holes provided in the rotating rings at one-inch from the inside face of the steel form. Nuts on their threaded ends were tightened with a strain wrench until each rod was stressed 30,000 lb. per sq.in. The steel forms were thin-coated with a rosin solution and placed in the spinning machine in pairs, ready for casting the section of pipe.

Concrete cast centrifugally

Concrete from a nearby batch mixer was dumped on the concrete floor at each end of the pipe and while the pipe was rotated at 90 rpm. sufficient concrete was shoveled into the forms to cast one-half of the wall thickness. Spinning was then increased to 250 rpm. for 10 min. to compact the concrete and drive out excess water. Another batch of concrete was then dumped on the floor, spinning was resumed at 90 rpm. and the balance of the wall thickness was formed. Spinning was again increased to 250 rpm. for 12 min. while a steel bar was slid along the inner surface of the pipe to true up the concrete surface. While the pipe was spun for an additional five minutes, a thin coating of rich mortar was troweled into the interior surface resulting in a very dense concrete. Spinning the wall in two operations insured the removal of all excess moisture and prevented segregation of the materials.

Sections cured for 24 hours

Immediately following the casting of each section it was transported to a steam room and cured for 24 hr. after which the tension nuts on the longitudinal reinforcing rods were unscrewed and the forms removed. The 30,000 psi. tension previously applied to each rod was transmitted by bond action into the concrete resulting in a longitudinal prestressing compression of 90 psi.

Following an additional 48-hr. period of steam curing, the pipe was placed in a wire-stressing machine

r wrapping. An automatically con-olled wire feeding mechanism oved parallel to the pipe wrapping spirally with a No. 6 wire spaced 51 in. apart under a 2,600 lb. ten-n that induced 1,500 psi. compres-on in the concrete inner wall. Wire r wrapping was made of oil-tem-ered, spring steel having a minimum timate tensile strength of 210,000 si.

Special type of joint

In order to insure a water-tight ressure joint, a steel sleeve contain-g a rubber gasket was pulled on e end of each section. Wire mesh inforcement was set over the sleeve d extended back 8 in. over the pipe. he steel sleeve is 12x¼-in. with 1-in. anges turned up on each end and, nce it is bonded to the pipe, it serves a bell. On the inside of the bell, in. from each end, are two half-und steel stopper rings that pro-de a stop for the rubber gaskets. fter installation of the sleeve the pe was set on end with the sleeve nd resting on a cast iron base ring. s a protection against corrosion of e wrapping wire, a 1-in. concrete all was cast around the pipe in a eel form to which was attached an ectric vibrator. Several sections of pe were enclosed in a sectional ooden housing and steam cured for o days; one day in the forms and ne day with the forms removed. Up-removal from the pouring rack, e pipe sections were ready for in-allation.

High pressure tests

Such care was exercised in the anufacture and installation of the 1,244 ft. of water line that it suc-ssfully withstood the several pres-

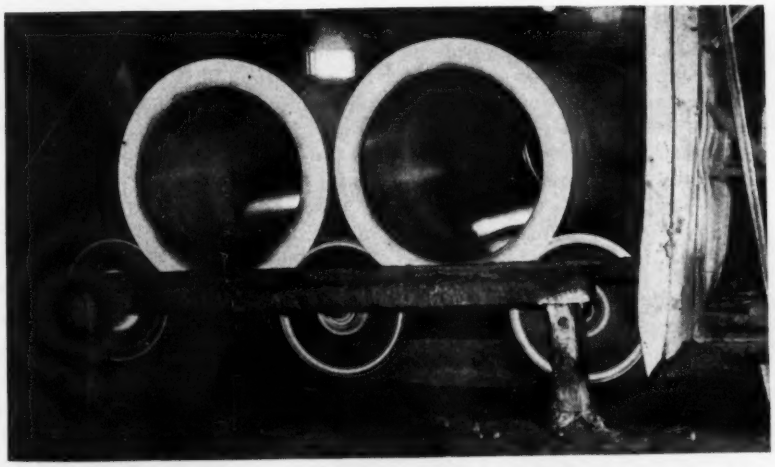


Fig. 2. Inner shell of concrete pipe is centrifugally cast in two separate spinning operations to remove excess water and to secure dense, dry concrete.

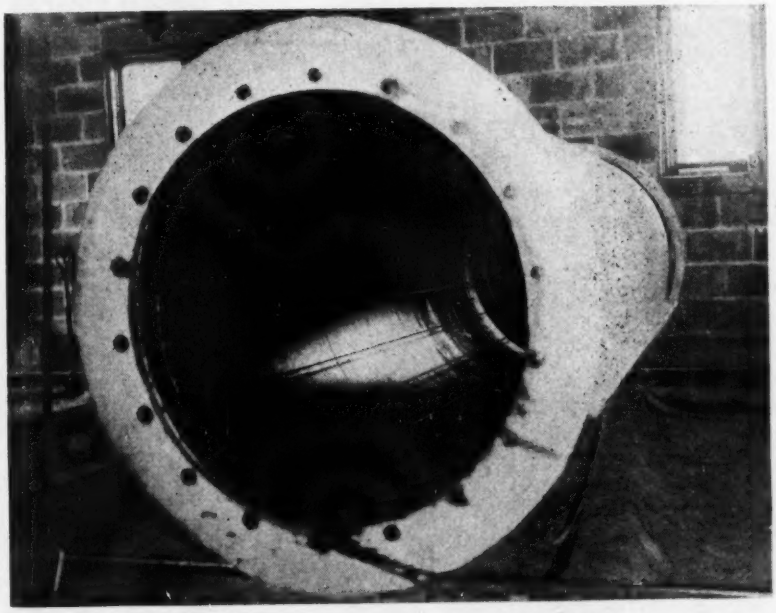
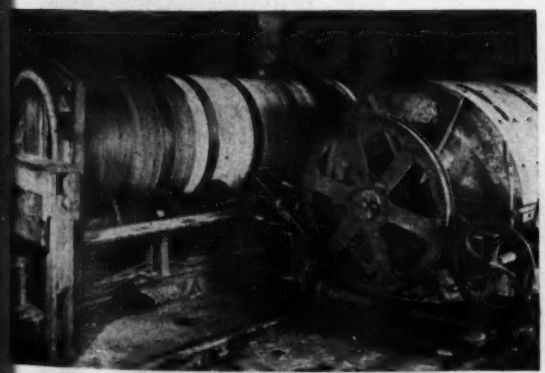


Fig. 3. Longitudinal reinforcing rods are prestressed to 30,000 lb. per sq. in. by tightening their end nuts against cast steel rotating rings.



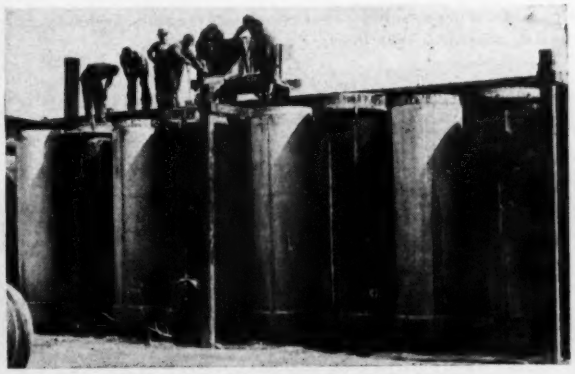


Fig. 4. An automatic wire-stressing machine (left) spirally wraps the concrete shell with No. 6 spring-steel wire. The pipe stands upright on its bell-end (right) while a one-inch protective coating of concrete is cast around the wire wrapping previously applied to the inner shell.

sure tests called for in the contract. Of special interest is a test made on one 3-day old section by the testing laboratory of Purdue University. This pipe had been wrapped but not coated and when it was placed in an hydraulic testing apparatus a Huggenberger strain gage attached to the wire indicated an increase of 6,000 psi. stress in the prestressed wire when the internal hydraulic pressure was built up to 200 psi. This brought the total stress in the wire to 96,000 psi. which was well below the yield point of 160,000. At the same time compression in the concrete was reduced from 1,500 to 300 psi.

The pipe was made by the Lewistown Pipe Co., and furnished at the site by the Material Service Corp., both of Chicago. Installation of pipe was by the city forces of the Chicago Department of Public Works, of which O. E. Hewitt is commissioner and W. W. DeBerard is city engineer. Immediate construction was under M. E. Boylan, district superintendent and J. E. Eddy, assistant engineer, both reporting to B. W. Cullen, superintendent of water pipe extension. W. B. Weldon, assistant engineer, prepared the specifications and had charge of inspection at the plant where the pipe was made.

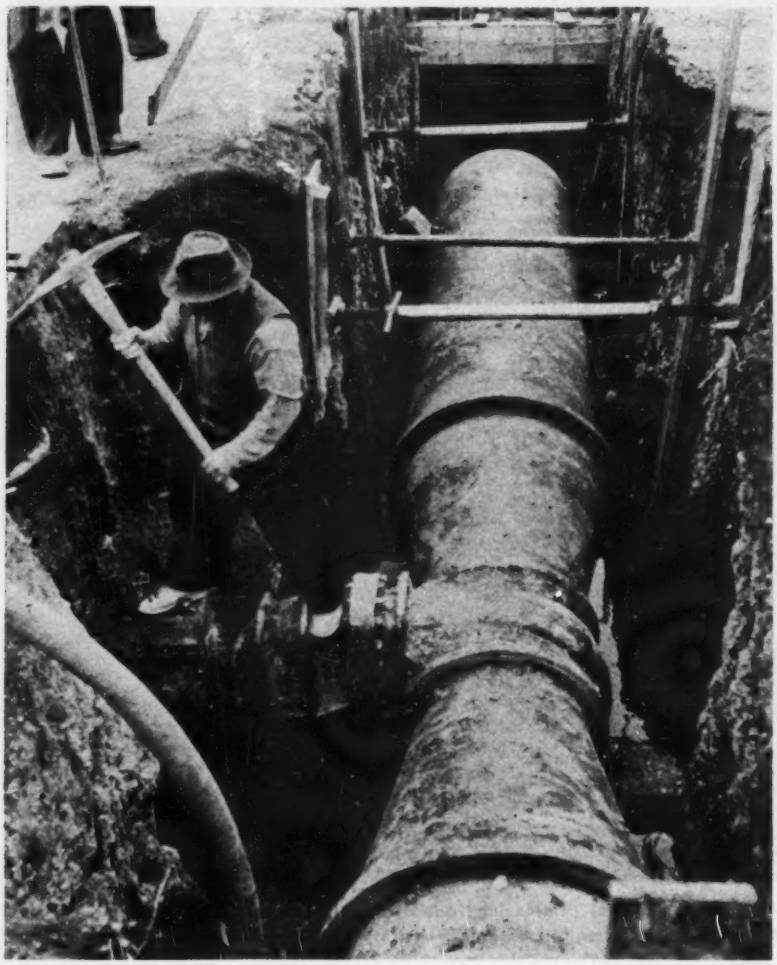


Fig. 5. Cast iron valve connections are readily installed in the feeder line with sealed, pressure-tight joints.

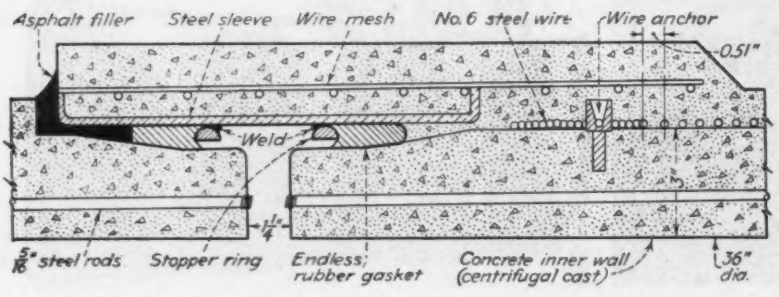


Fig. 6. Positive resistance to hydrostatic pressure is insured by a special metal sleeve on the bell end to which is attached an endless rubber gasket. Anchor lugs embedded in the 3-in. inner shell stay the ends of the wrapping wire.

Survey Made of Activated Carbon Use

Activated carbon for control of tastes and odors in water supplies is used by more than 1,200 plants, according to a survey made by E. A. Sigworth, chemist and technician of the Industrial and Chemical Sales Division of the West Virginia Paper and Pulp Co.

Mr. Sigworth, who reported his findings at the recent conference of the American Water Works Association, stated that activated carbon was first applied for taste and odor control in 1930 at the New Milford plant of the Hackensack (N.J.) Water Co. Actual sales records coupled with a report made by the U. S. Public Health Service, indicate that today a total of 1,164 plants are using activated carbon. The total would be increased, he said, if plants at Army camps and in other countries were included.

Of the total number of plants reported, there are 842, or 72 percent, on which sufficient records are available to draw the following conclusions:

1. Average annual dosage per million gallons is 10.6 lb. (Highest was 760 lb./mg. at Trenton, Mich.)

2. Still (quiet) water supplies require higher average carbon dosages, indicating that alga is still the predominating cause of tastes and odors in water.

3. Smaller plants use higher proportions of activated carbon, possibly because feeding equipment is not sufficiently accurate to proportion small dosages. However, another factor is the tendency to under-treat in order to reduce chemical costs.

4. Predominant point of carbon application is during coagulation or prior to sedimentation.

Reservoir Roof of Unreinforced Arches

Contents in Brief—To save steel in constructing water supply improvements at Springfield, Vt., a reservoir was built with the walls, columns, and roof all of plain concrete, the roof consisting of a series of groined arches. After the walls had been constructed for the greater part of their height and the columns to full height, the roof was built in alternate sections. The floor, also free of steel, was added last. The construction schedule followed required placing much of the concrete during severe winter weather.

BASED UPON EXPERIENCE gained early in the century in covering filter beds and reservoirs with groined arches of plain concrete, the engineers in charge of water supply improvements recently completed at Springfield, Vt., designed a reservoir with that type of roof. As a result, not a single piece of reinforcing steel was used for the 600,000-gal. structure. Although work had to be carried on during severe winter weather, including the placing of much of the concrete, no unusual construction problems were encountered and the time required to build the reservoir was little longer than that which would have been required under existing conditions had steel been available for a reinforced-concrete design.

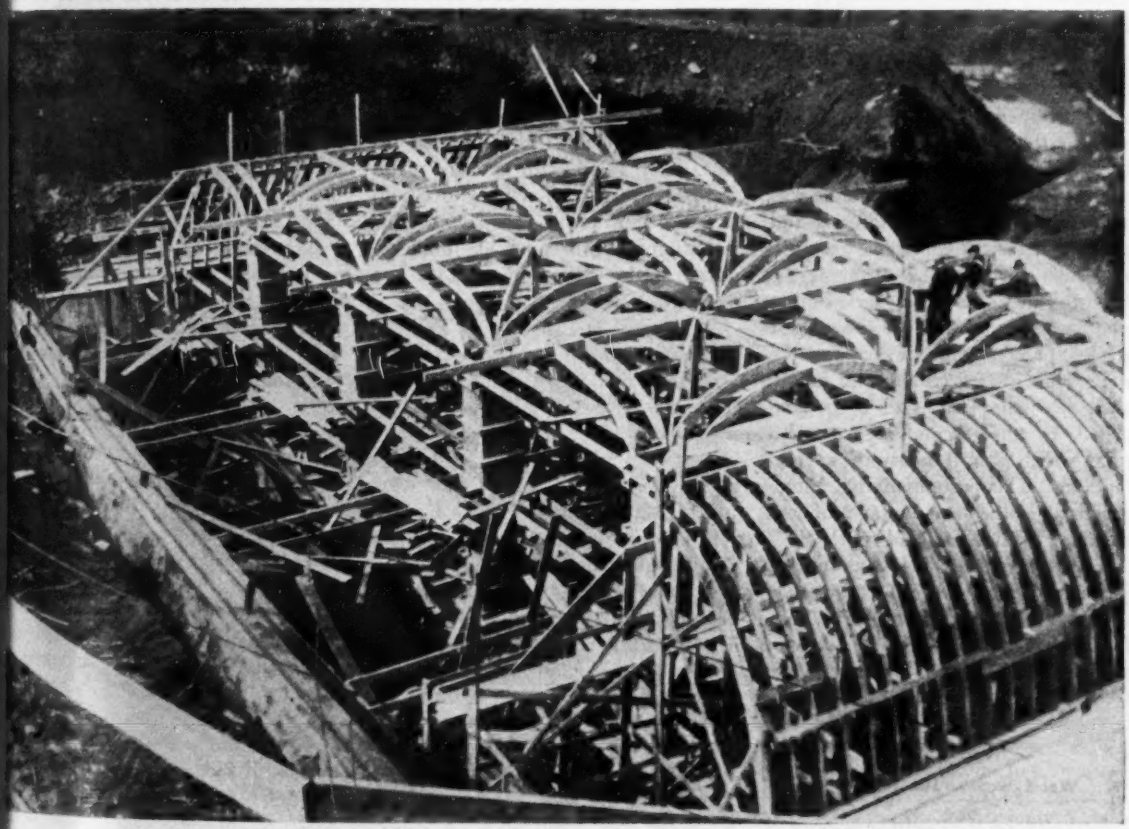
Standpipe originally planned

The original plan was to build a steel standpipe, but as the structural steel supply became critical, a reinforced-concrete reservoir was next considered. However, by the time the desired federal-aid funds had been received, reinforcing steel was extremely difficult to obtain. As a result, a plain concrete structure with a groined arched roof and gravity-type walls was built.

A general plan of the reservoir and a typical cross section are shown in Fig. 3. The structure measures 67 ft. by 84 ft. inside. Spaced 16 ft. 7 in. each way, the columns are 24 in. square, and are 14 ft. 3 in. high from floor lever to the springing line of the arches. The arches have a rise of 3 ft. 5 in. and a minimum thickness of 6 in. The upper surface of the roof is flat, there being no depressions over the columns.

The maximum depth of the water in the reservoir will be 15½ ft.

In constructing the reservoir all foundations were carried to rock of



Lone Star Cement Corp. Photo

Fig. 1. Interior forms for the roof were made of 2 x 10-in. ribs on 20-in. centers, cut to the arch curve, and ¼-in. plywood bent to the same curve.

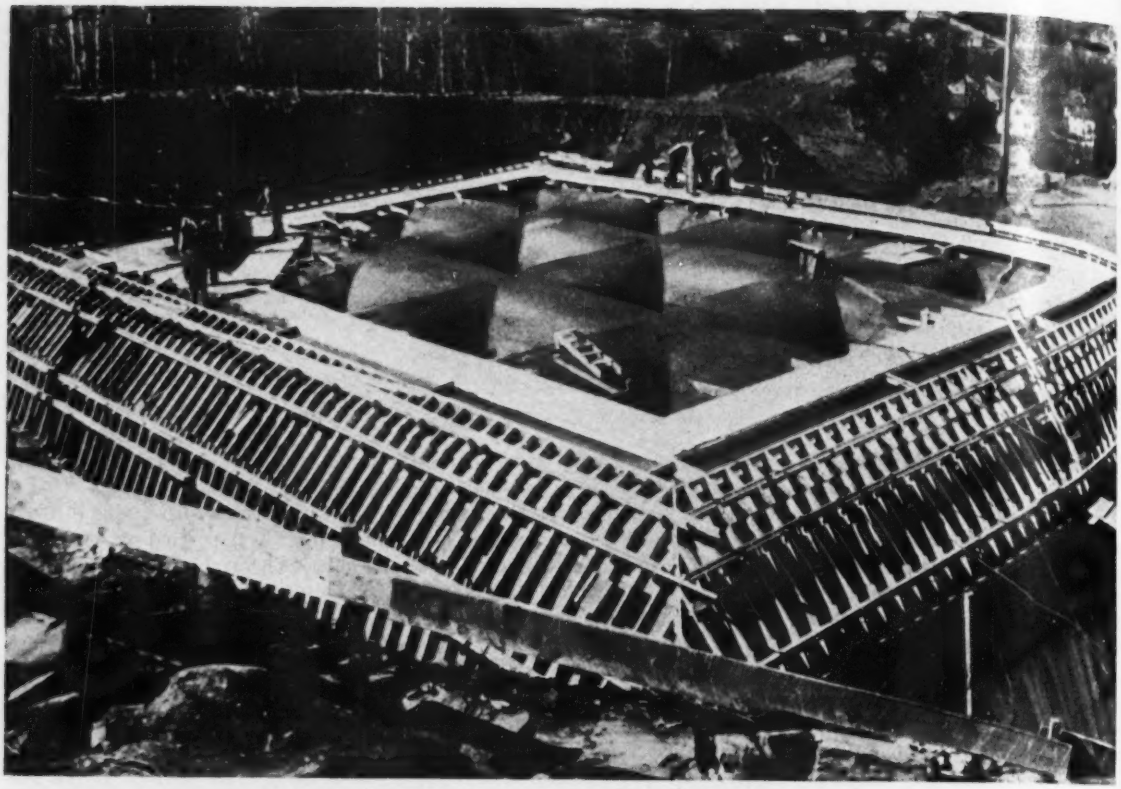


Fig. 2. Forms in place for construction of the upper walls in alternate sections. Concrete in the walls was carried up to include part of the roof arches that are supported on the walls.

good quality, the whole reservoir area being stripped of the top soil. Footings for the columns then were built up to a little above floor level, using rough forms. Once this concrete was in place, forms for the columns and interior forms for the walls were set, plus sufficient of the exterior forms to permit the walls to be carried up to a construction joint 7½ ft. above floor level. The exterior forms for the walls were not carried to full height until after the walls had been completed to the second construction joint, which is 4½ ft. above the springing line. The accompanying photographs show the various stages of construction of the walls and roof.

Forms for the walls consisted of ⅝-in. plywood nailed to 2 x 6-in. studs spaced on 20-in. centers. The roof forms consisted of ¾-in. plywood nailed to 2 x 10-in. ribs cut to give the required shape to the finished concrete. For each horizontal waler two 2 x 6's were used.

Wood waterstops in joints

In building the walls an unusual type of waterstop was used in the vertical construction joints (Fig. 3). A ½ x 11-in. maple board coated with asphalt was embedded in the concrete and on the inside face a beveled recess, later filled with mortar made from non-shrinking cement to create a water-tight joint, was added. Installation of this type of joint required little work and to date has proven satisfactory.

To permit the roof to be built in alternate sections, construction joints were used both ways at the crown of the arches (Fig. 3). Keys were not provided at these joints, as they were considered unnecessary by the designing engineers. No fillers were used in these joints. Before backfill was placed over the reservoir, these joints were painted with asphalt but the remainder of the roof was not covered with waterproofing material. The backfill consisted of earth in depths varying from 20 to 28 in., the top 8 in. being loam.

Construction of the floor was left until last, the concrete being delivered by steel chutes through a temporary opening in the wall. The completed walls and roof provided good protection against the weather, which was of great advantage because of the low temperatures experienced. The floor, which is a 6-in. non-reinforced slab, was built in alternate sections and non-shrinking cement was used to fill the beveled recesses of the joints (Fig. 3).

Excavation of the site to rock left an irregular surface on which to lay the floor. This was leveled by filling with Class B concrete to 6 in. below floor level, thus reducing the Class A requirements.

Ordinary cement used

For all of work except the Class B concrete just mentioned, the concrete mix was one part of ordinary portland cement and six parts of a combined sand and coarse aggregate. The concrete was produced by a 3-bag paver set up on the site and batched by truck. Concrete was delivered by chute and buggies, and was vibrated in place.

Construction started in September, 1942, and the reservoir was completed in July of this year. Work continued throughout last winter with a temperature of 40 deg. below zero recorded a few days. Concrete was placed while the temperature was as

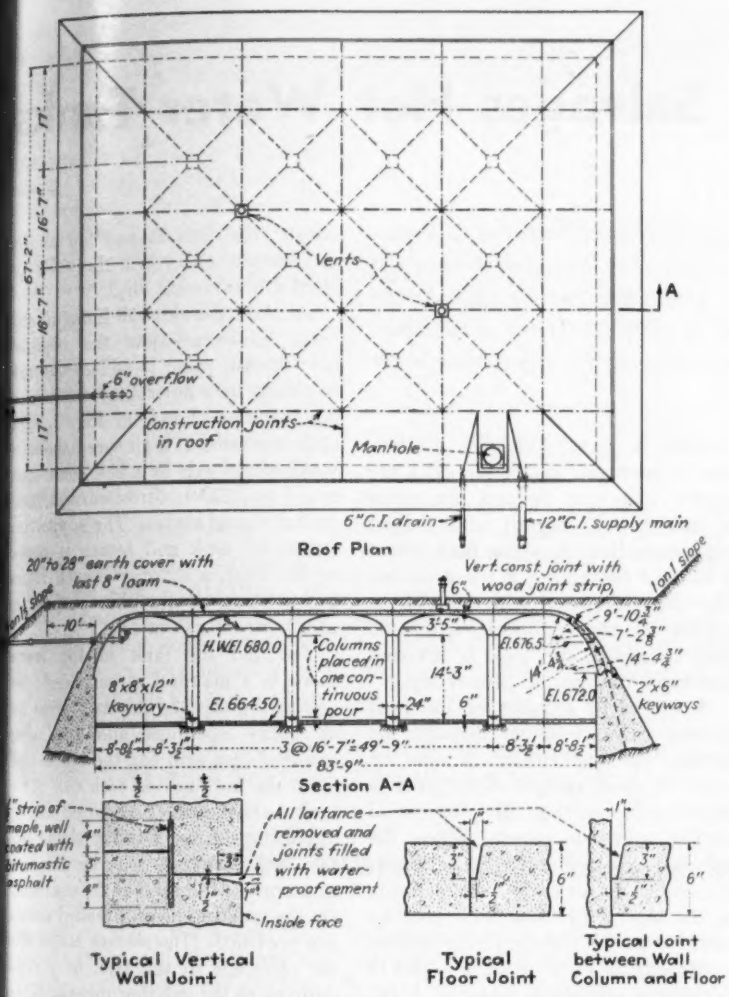


Fig. 3. Walls, columns, and roof of reservoir are of plain concrete. The roof was built in alternate sections, which required construction joints each way along the crown of the arches.

Fig. 4. Interior of the completed reservoir. The floor was laid after completion of the walls and roof, which served to protect the concreting operations from the winter weather.

low as 10 deg. above zero. The water and aggregate for making the concrete were heated with live steam produced by a small coal-fired boiler. As an added precaution against cold weather, the freshly placed concrete was enclosed with a frame work covered by tarpaulins and the enclosed space was heated with live steam and salamanders.

This work included excavation of 6,000 cu.yd. of earth and 1,849 cu.yd. of rock and the placing of 1,363 cu.yd. of class "A" concrete and 67 yd. of class "B". Cost of the completed structure was about $52,000.

Those in charge

For the town of Springfield, Village Manager J. Leslie Giddings was in charge. Metcalf and Eddy, Boston, Mass., were engineering consultants on the work, Harry L. Kinsel supervising design, and Gordon Hanson supervising construction as resident engineer. M. J. Burrington, Jr., of Bennington, Vt., was the general contractor. The Work was carried out as a Federal Works Agency project under the direction of J. A. McConnell, assistant regional director at Boston, Mass. During the major portion of the work the late Edward Byrne as construction engineer represented FWA on the job.

Baltimore Water Supply To Be Expanded

A detailed schedule of the materials and equipment needed to start work on the $5,000,000 project to pump a supplemental water supply to the city of Baltimore, Md., from the Patapsco River has been completed by the Bureau of Water Supply and forwarded to Washington as a basis for the granting of priorities.

This undertaking when completed will add an additional 40,000,000 gal. daily to the present water supply derived from the Gunpowder River, which is heavily taxed during low water periods, and due to the vastly expanded consumption of water by an increase in population and expanded war industries.

Leon Small, head of the Baltimore Department of Water states that the supplemental project will require about 15 to 16 months to complete. It is to be financed through an allotment out of the $12,000,000 water loan approved last May by the voters of Baltimore.

Cement Lining Salvages Hot Water Tanks

***Contents in Brief**—Leaky household water tanks are salvaged at Columbus by addition of a thin inner lining of cement. The lining for the top and bottom is added by standing the tank on end, but to line the sidewalls the neat cement is placed inside the tank and the container rotated at 550 r.p.m. about its longitudinal axis. Work to date indicates that this method is not only satisfactory but inexpensive.*

NOW UNDERWAY are a series of experiments by the city of Columbus, Ohio, aimed at salvage of leaky hot water tanks of the size commonly used in private homes. Results to date indicate that a leaky tank thinly coated on the inside with neat cement paste is very serviceable. The studies also show that satisfactory repairs need not be costly nor require extensive materials and labor. With present shortage of steel, the repair methods are considered a possible solution to the problem of extending the life of old tanks.

Old galvanized tanks of 30-gal. capacity, 12-in. dia., and 60-in. height salvaged from junk piles or given to the city water department are being repaired. The only preparation before the neat cement lining is added is to tap the tank lightly with a mallet to dislodge any loose rust, and to wash the tank thoroughly with water.

Neat cement paste used

A neat cement paste made with about 5 gal. of water added to ½ cu. ft. of low-soluble, corrosion-resistant cement, measured loose, is used to line the tank. To date, linings of ½ in., ⅜ in., and ¼ in. have been used; present indications are that a thickness of ⅜ to ½ in. is satisfactory.

In applying the lining, the top of the tank is coated first, then the bottom is lined and finally the sides are treated. To coat the top, the outlet at this end is plugged with a steel pipe extending into the tank about 2 in. and containing a wood center. The plug is coated with paraffin to permit its easy removal. After the plug is added, the tank is inverted and supported on the former top.

A measured amount of the neat cement paste is added through the bottom opening (which is now on top). A small sample of the paste is placed aside so that the progress of setting may be noted. When the sample reveals that the paste is beginning to harden, the cement lining in the top of the tank is covered by about ½ in. of water. If the bottom is curved, sufficient paste is added to provide a minimum cover of ¼ in., which may result in a maximum depth of 2 in. The tank is left standing in the inverted position for a couple of hours.

At the end of this period the drum is turned right side up, the water drained out, the bottom drain plugged, and the bottom coated in the same manner as was the top. When the bottom has been lined and covered with water, all openings in the tank are closed, which keeps the lining at both the top and bottom moist. The bottom and top usually are lined one day and the walls are lined the following day.

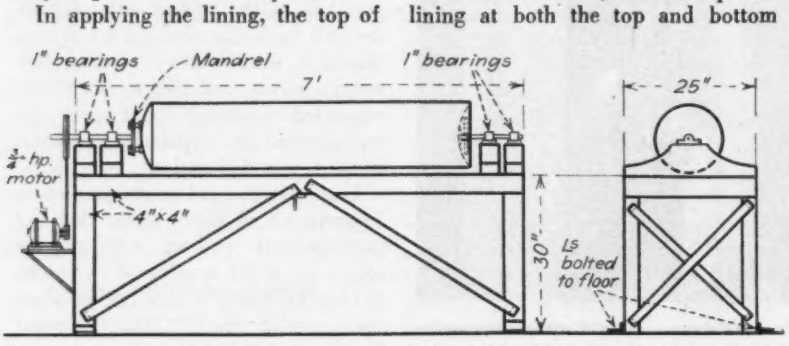


Fig. 1. To apply cement linings in household-type hot water tanks, the "rotating" machine illustrated was developed at Columbus.

To make the sidewall lining of uniform thickness after the required neat cement paste is added, the tank is placed in a horizontal position on the machine shown in Fig. 1. The tank is rotated at high speed about its longitudinal axis by a belt connection to a ¾-hp., 220-v., direct-current, compound-wound motor. The supporting frame for tank and motor is bolted to the floor, a sturdily braced frame being required for this purpose to avoid excess vibration.

To hold the tank in the frame there is a mandrel at each end; the one at the top end has two arms for as many openings and the other mandrel one arm for the single outlet at the bottom. At each end of the tank a short shaft is required and by unbolting the top bearing at the bottom end, that shaft may be slid back to permit installation of the container. On the mandrel arms threaded sleeves are provided. The sleeves screw into the openings of the tank to prevent damage to the existing threads at the openings.

High speed proves best

A speed of 300 r.p.m., which was tried first, proved to be inadequate to create sufficient centrifugal force, and the lining was not of uniform thickness. A speed of 550 r.p.m. now is used, and it is proving very satisfactory. This speed is attained in about 5 sec.

Before placing the motor in operation the tank is rotated slowly by hand four or five times to spread the cement paste lengthwise along the container. Then the motor is placed in operation for a few seconds, shut off for a short period and then turned on again before the tank stops rotating. By a repetition of this process the 550-r.p.m. speed can be obtained without serious vibration. By use of a rheostat the speed of rotation could be "built up" more conveniently.

The first tank lined was rotated for 70 min., the second for 55 min., and the third for 45 min. In order

delay the setting until the desired tation speed is attained, cold water used in making the mortar. A tation period of 30 min, is suffi-ient.

As rotation ends some water re-ains in the tank and this is drained immediately. In this operation re must be exercised to avoid reaks in the lining. The most satis-ctory answer to this problem has en to watch as the tank comes to a op and to make sure that the two ugs in the holes in the side walls e on the underside when rotation ds. If the plugs are removed ickly when on the underside, the cess water will drain away without using streaks in the lining.

Steam used for curing

After the water is drained the tank left on the machine for 10 to 15 in. and then removed for inspec-on. If the lining appears satisfac-ry, all the holes are plugged to re-in moisture within the tank, which set on end and left undisturbed r 24 hr.

At the end of this period the lining is cured for 48 hr. The curing is accomplished by filling the tank with cold water and then gradually heating the liquid by passing steam or hot water continuously through the tank. In this operation a steam pipe is connected at the top of the tank to extend almost to the bottom. Excess water from the condensed steam is drained away in a second pipe attached at the top. This arrangement permits a continuous curing temperature of about 200 deg. F. and gives to the lining a glazed appearance.

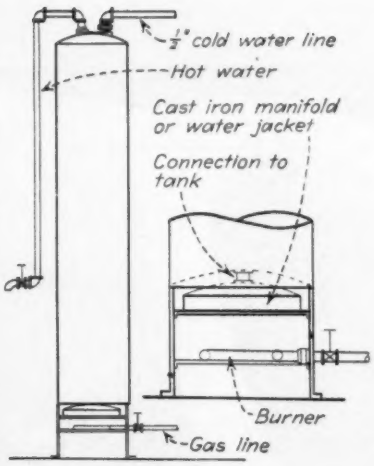


Fig. 2. To avoid a flame directly on the bottom of a repaired tank a cast iron water jacket is attached to the tank.

It is considered inadvisable to put a flame directly under a tank so repaired. Instead a cast iron manifold or water jacket is used below the tank. The jacket is attached to the bottom of the hot water tank and the flame used to heat the water in this manifold. However, use of the jacket generally will not be required at Columbus, as most tanks in that area are heated in a manner other than with the flame coming directly into contact with the bottom of the tank.

For the city of Columbus, C. B. Hoover is head of the water department and Charles P. Hoover, chief chemist, is in direct charge of the work described, details of which have been worked out by John L. Fowler. Exact costs are not available for the work to date, but estimated costs per tank are not great.

Timber Water Tank Serves War Plant

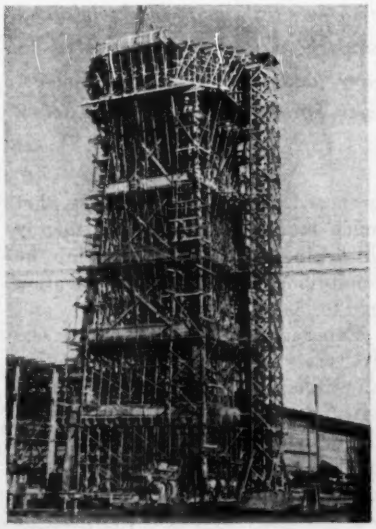
an aircraft plant, the Austin Co., eveland, Ohio, and the Corps of gineers, U. S. Army, collaborated cently on the design and construc-n of a 100,000-gal. timber water k supported by a high, rigid-me, reinforced-concrete tower. sting on footings extending 10 ft. low the ground, the tower is 115 high. It is capped by a 30-ft. dia. dwood tank 21 ft. high.

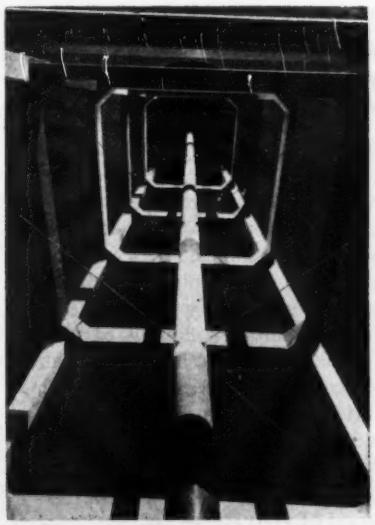
In general, the four concrete col-ns for the tower are 24 in. square. ey are spaced on 35-ft. centers at base and 21-ft. 3-in. centers at top, the batter giving increased eral stiffness and greater stability inst overturning, as well as a good hitectural motif.

The tower legs are braced in rendeel fashion with rigid-frame ts at intervals of 19 ft. The struts 30 in. deep, except at platform el, where the depth is increased to to support a grillage of concrete nage beams.

Construction of the tower required cu.yd. of excavation, 235 cu.yd. concrete and 29.5 tons of steel. Of 3 in. thickness, the tank floor is laid directly on the concrete supporting structure. The redwood stave sidewalls, also 3 in. thick, are held in place by ¾-in. dia. circumferential steel hoops on a variable spacing. The tank roof is supported by the sidewalls and by means of auxiliary timber columns within the tank.

Bracing for the steel riser pipe, which is of 24-in. dia., consists of steel diagonal rods equipped with turnbuckles for adjustment. The rods also form horizontal lateral systems in each story of the tower.





Construction of the reinforced-concrete tower (left) required a large amount of form lumber. Completed tower (right) has a pleasing appearance.

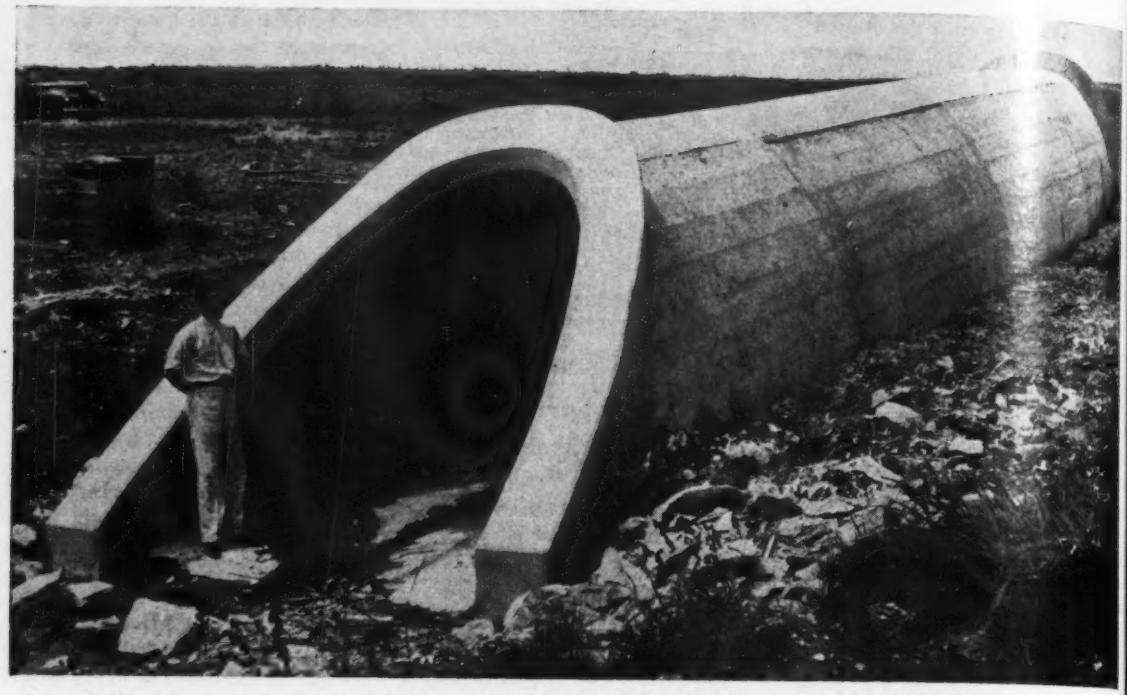


Fig. 1. Substantial collars of plain concrete protect end-sections of concrete arches under Kansas highways.

No Steel in Kansas Concrete Culverts

T. W. Oliver
Associate Office Bridge Engineer, Kansas State Highway Commission
Topeka, Kan.

Contents in Brief—*Even before reinforcing steel became scarce, Kansas highway engineers were looking into the design of unreinforced concrete arch culverts. Carefully designed for varying loads and lateral pressures, the arches are economically constructed, costing very little more than reinforced concrete structures. Earth backfill is properly placed and compacted to avoid excessive stresses even under heavy loads and high embankments. Plain concrete footings supporting the arch barrels are placed well below stream-bed to prevent scour.*

KANSAS STATE HIGHWAY COMMISSION engineers weren't caught short by the sudden curtailment of reinforcing steel and metal pipe for drainage structures, for early in 1941 they had begun studies on designs of unreinforced concrete arches. Anticipating the coming restrictions on critical materials, the designers intensified the studies following Pearl Harbor, and as a result the state has included substantial, permanent culverts in its program of vital access highways. However, the studies showed sound engineering practice is required for proper design of plain arches, that much more is involved than merely thickening the shell and omitting the reinforcing. Even careful attention had to be paid to backfilling.

Experience accumulated during several years of design and construction of reinforced concrete arches simplified the preparation of plans. Essential design requirements are: The use of reinforcing steel must be completely eliminated; structural safety and adequacy of waterways must be insured; structures must not be unduly expensive, and designs and plans for structures should be readily and easily prepared.

Several factors are considered in determining the size and shape of arches in which there must be no bending in the arch ring. Reactions from vertical loads and lateral pressures should be vertical through the center of the wall section at the spring line, and for any given rise of arch and depth of fill over crown, the span chosen must not be too wide or the arch will fail at the top from vertical load. Likewise, if the span is too narrow, failure would occur in the side walls from the horizontal thrust of the embankment. For all installations, a single definite shape and span lying between these two extremes can be found that will function satisfactorily. Considerable graphical research involving earth pressures and variable dead loads on an arch ring proved that for all practical purposes the required shape is close to an ellipse of either three or five centers.

The general policy of design adopted is one in which the arch axis (generally a simple ellipse) conforms to the pressure line with reactions vertical, or nearly so, whenever footings are founded on earth. Sufficient barrel-thickness is used to insure pressure lines falling well within the arch ring section under side pressures of both 20 and 40 lb. per ft. of fill, corresponding to a variation of 15 deg. in the angle of internal friction. Designs are not treated as problems in mere structural mechanics, under the tacit assumption that plain concrete could be used as a rough structural material. Plain unreinforced concrete, when used for barrel arches under uncertain conditions of earth thrust and foundation material, is primarily masonry construction, and conservative judgment indicates designs should be made from this angle. Concrete arches are usually treated as an elastic ring when reinforced, but they should be handled as simple, statically-determinate structures when unreinforced.

Lateral earth pressures are calculated by Rankin's method, admittedly not exact since it neglects some factors of importance for various type soils. Therefore, some practical modifications are necessarily employed, based on previous experience with similar structures. Arch axes are made to coincide with the equilibrium polygon or pressure line of a 30-lb. lateral earth provision of the A.A.S.H.O. specifications. Minimum thicknesses of 9 in. at the crown and 12 in. at the spring line are specified for the arch barrels, resulting in slightly more massive and substantial structures than are usually found in similar types of construction. Sidewalls are centered on plain concrete footings carried well below flow line. As a protection against scour, a concrete floor, with toe walls at the arch ends, is built independent of the arch and footings. Where rock exists at the streambed, or for cattle passes carrying no drainage, this floor is usually omitted.

Preliminary design

For preliminary designs and estimates of barrel arches Fig. 2 contains the following inter-related factors: Fill above crown of arch; clear span of arch, and thickness of the barrel-arch at crown and spring line. Areas of waterways obtained from the various sized openings are shown directly on the curves. Therefore, with fill above crown and rise of arch known, it is easy to enter the graph and determine the span required and waterway provided.

Arches proportioned for dead loads

The shape of arches shown in this chart are proportioned for dead loads only. Earth filling is assumed at 100 lb. per cu. ft., and a lateral earth pressure of 30 lb. per sq. ft. is used. Dead load weight of the arch ring was calculated from the table of thicknesses shown. The arch curve is elliptical and the bending moment at both crown and spring line is zero. Reactions are vertical through center line of section at the spring line, and thicknesses shown are approximate only and were used for dead load assumptions. Inspection of these curves reveals that for smaller size arches a considerable difference in depth of fill above the arch makes only a slight difference in the required span. This means that for arches below, say, an 8-ft. height, a single standard plan can be made to serve practically all situations, an important consideration in a statewide construction program.

Concentrated live loads acting through shallow fills produce certain bending in the arch ring, and the actual effects transmitted to the sharply curved sides of an arch barrel (both lateral and vertical effects) pose quite an intricate problem in design. Lacking guiding information on live load effects, either in technical literature or specifications, and having observed the successful functioning of many large, spandrel-filled stone arches of varying rise-span ratios covered by only a few inches of earth at the crown, it was considered reasonably safe to ignore the effect of live load and use a 2-ft. minimum fill over small arches, increasing to 4 ft. for 20-ft. spans.

Typical design problem

The physical requirements of an unreinforced arch are revealed by considering a typical case. Fig. 3 shows an arch of 12½-ft. span, 10 ft. rise, and carrying a 10-ft. fill over the crown. The weight of fill was assumed at 100 lb. per cu. ft. and the arch was considered hinged at the top of footing. Actually, the arch will be partially fixed by the footing but the hinged condition is the most unfavor-

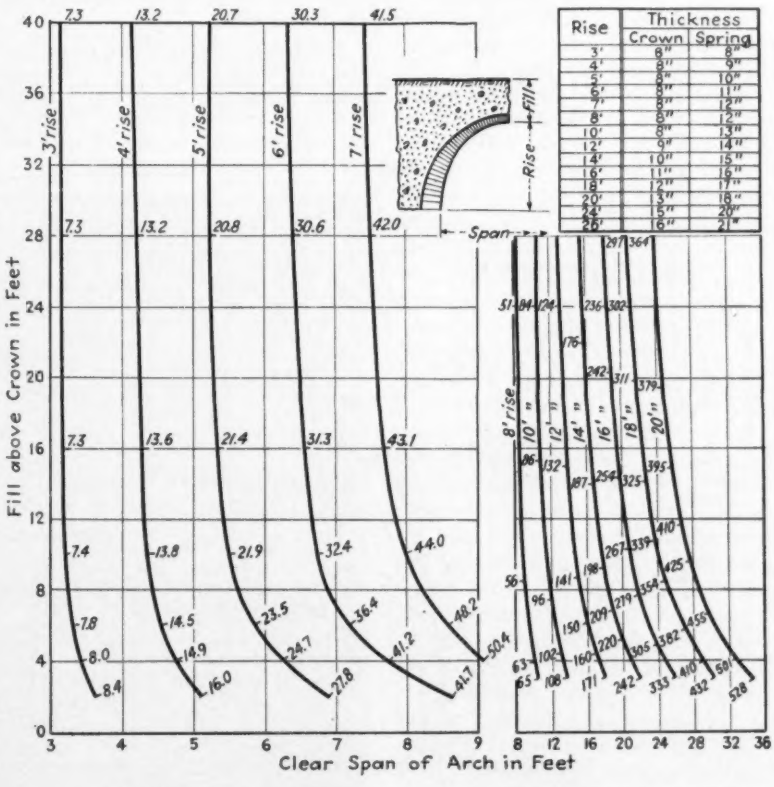


Fig. 2. Required span of arch for varying rise and depth of fill is determined from this chart, which also shows barrel thickness for preliminary design. Areas of waterway are shown directly on the curves.

able and was chosen for that reason.

Pressure lines are shown for both 20 and 40 lb. per ft. of fill height, and the arch axis conforms to a 30-lb. pressure line. Both two-hinged and three-hinged conditions are considered; the latter would prevail if the concrete cracks at the crown, rendering it incapable of taking tension. The equilibrium polygon or pressure line passes through the third-points of the wall sections at the crown and spring line, falling well inside the middle third of the section for both conditions of loading. Reactions through the footings from all loading conditions cannot be made truly vertical but the variation is so slight that the horizontal component is not significant—the angle being only 15 deg., which is well below the angle of coefficient of friction for concrete on earth. In addition, any tendency toward outward movement of the arch walls immediately mobilizes the passive resistance of the earth, while any tendency toward inward movement is resisted by the concrete floor.

Arch stability

The condition for instability or failure of a masonry arch, cracked so as to be incapable of taking tension, is that the line of pressure must simultaneously pass out above the arch ring at the crown, and leave the inside of the arch ring near the haunches, or vice versa. This condition does not occur and therefore the arch would not fail, even if it was made up of a number of unconnected blocks. This example shows how easily the proper arch thickness may be chosen to meet varying demands of load and structural action.

Sloping end sections

Ends of barrels are built on a slope to blend with adjacent roadway embankment, thus constituting cantilever retaining walls subject to heavy earth thrusts. Where embankment sideslopes are steep, these extensions are short and considerable support is derived from the barrel. Present practice is to use unreinforced arches with side slopes no flatter than $1\frac{1}{2}$:1, and with a heavy stiffening collar around the sloping ends. In addition, no transverse joint is permitted in the barrel closer than 10 ft. from the collar. For arches of more than 8-ft. rise, or on a skew, wings necessarily are longer and counterforts are added on the outside of the barrel-ends for stability. Where rock is available, the ends are usually built on about $\frac{3}{4}$:1 slopes and stone riprap placed around the barrel ends.

Analytical investigations reveal that the arch shape can be varied considerably to accommodate different fill and waterway requirements, and still maintain the same internal radii for the barrel forms. The resulting arch axis does not conform exactly to the pressure line, but stresses set up by such non-conformity are not considered serious. Using the same radii for barrel forms of different sized arches substantially reduces construction costs, for the same form panels can be used for several structures. The span or rise of an arch is increased when required, as shown in Fig. 4, by using variable timber blocks between sections of standard panel forms or by splicing an extension to the lower panel. Arches are easily reduced in size by cutting the panel forms as desired. Slight modifications in the size and shape of an arch are accomplished by varying the location of the center of the ellipse for the lower form panels.

Curing of concrete

Shrinkage of concrete is of vital importance, and during wide seasonal climatic changes, cracks may occur on the inside of the arch at the crown. Under favorable climatic conditions, proper curing and normal backfilling, no damaging cracks should occur on the interior of the barrel, but cracks may be expected in the end sections where there is considerable exposure to direct sunlight and air movement

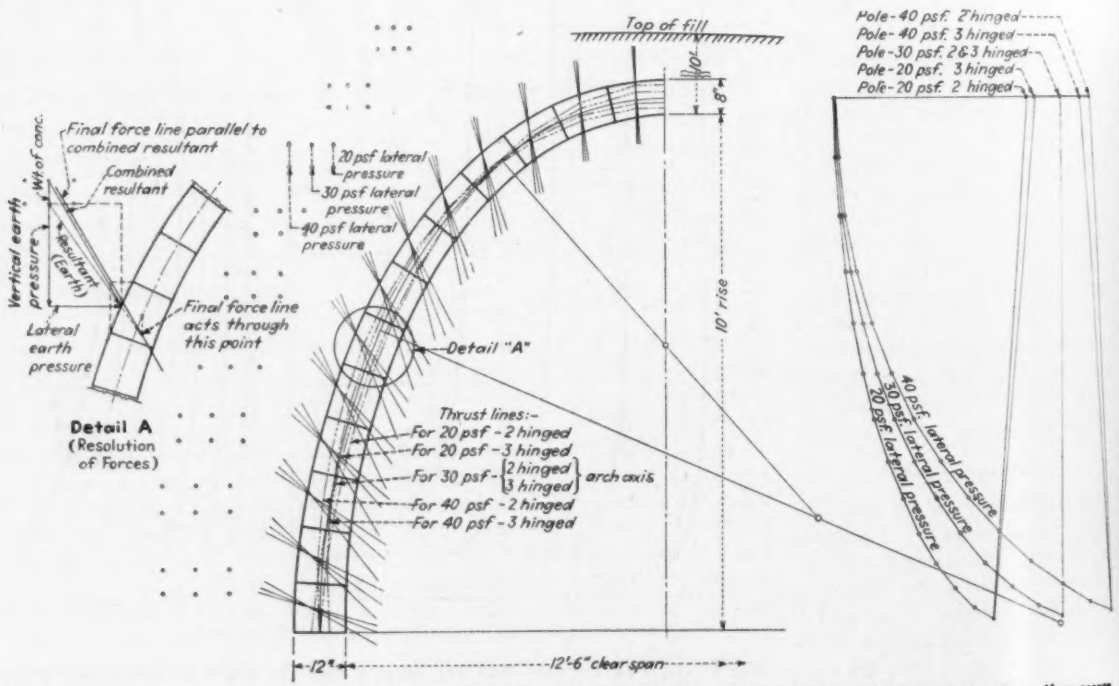

Top of fill
10'
8"
10' rise
12'-12"
12'-6" clear span
Final force line parallel to combined resultant
Combined resultant
W of conc.
Vertical earth pressure
Resultant (earth)
Lateral earth pressure
Final force line acts through this point
Detail A
(Resolution of Forces)
20 psf lateral pressure
30 psf lateral pressure
40 psf lateral pressure
Detail "A"
Thrust lines:-
For 20 psf - 2 hinged
For 20 psf - 3 hinged
For 30 psf - {2 hinged / 3 hinged} arch axis
For 40 psf - 2 hinged
For 40 psf - 3 hinged
Pole - 40 psf. 2 hinged
Pole - 40 psf. 3 hinged
Pole - 30 psf. 2 & 3 hinged
Pole - 20 psf. 3 hinged
Pole - 20 psf. 2 hinged
40 psf. lateral pressure
30 psf. lateral pressure
20 psf. lateral pressure

Fig. 3. Arches are designed for two-hinged and three-hinged conditions under both 20- and 40-lb. lateral earth pressure. Arch axis conforms to a 30-lb. pressure. Typical resolution of forces acting on an arch segment is shown in detail "A".

with very little earth cover to prevent drying out. Since the arch shape and thickness are designed for maximum fill over the central portion of the barrel, while the wings and end sections receive very little vertical load, any crack formed by shrinkage of concrete will tend to be closed by the lateral pressure. Excessive shrinkage cracks are avoided, particularly in the intrados, by thoroughly soaking the formwork before it is erected to prevent swelling while concrete is being placed and taking its initial set.

Concrete is cured by the continual application of water sufficient to keep the surface wet. After a 72-hr. curing period the interior bracing is struck, permitting shrinkage of concrete without restraint from the centering. As a further help to prevent shrinkage, it is found desirable to keep the cement factor as low as possible and still obtain the required strength.

Many arches built

A number of these unreinforced concrete arches have already been built on Kansas highways and their resistance to cracking has been closely observed. As predicted, about two weeks after forms were stripped a fine crack appeared in the end sections on the inside of the barrel at the crown. No cracking was apparent elsewhere throughout the structures.

On one project a number of barrel-arches were unavoidably exposed to the hot sun for ten weeks with no earth cover, resulting in an extremely fine shrinkage crack at the crown for the full length of the barrel. No serious trouble was encountered on this score, however, since the arch axes conformed to the expected normal position of the line of pressure, and the possibility of action as a three-hinged arch (hinges at footings and crown) had been considered in the design. Since this condition may arise frequently from various causes and is entirely beyond the control of the designer, it should be recognized in the design.

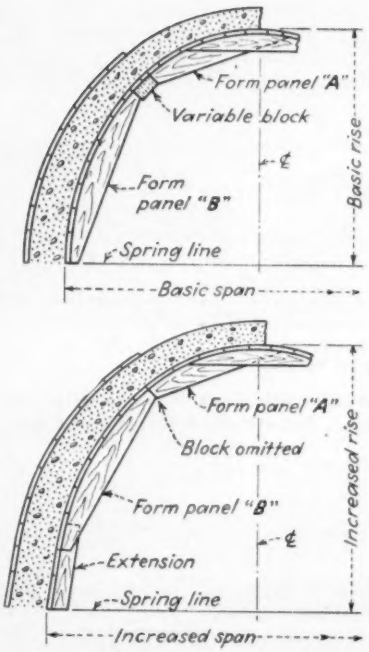


Fig. 4. Timber extensions and variable timber blocks are added to standard form panels to permit the reuse of forms for different sized arches.

Methods of backfilling

An unreinforced concrete arch is capable of withstanding the weight of the earth fill and the lateral embankment thrust, both occurring simultaneously, only because these two forces can be made to work against each other to eliminate all bending in the arch ring, requiring the concrete to withstand only simple compression. Therefore, if excessive earth pressure is created during backfilling along the barrel without a corresponding load being applied on top, the barrel may be seriously cracked and needlessly damaged, or perhaps fail entirely.

Therefore, backfilling operations are closely controlled and no fill is placed against an arch until concrete test beams show a bending strength of at least 500 lb. per sq. in. Water adjacent to the structure is drained and the soil is allowed to dry sufficiently for compaction before backfilling. All muck or saturated soil is removed ahead of placing backfill to secure a firm foundation. Where the top of the arch extends above original ground the backfill is carried to the top of arch and at least 10 ft. each side of the base across the full width of roadway embankment. The amount of compaction of backfill required at different installations depends on the character of the material involved as determined by a soil analysis.

Methods of backfilling around an arch are shown in Fig. 6, which also details the temporary bracing required inside the barrel until the entire load is placed. Close control over compaction is no innovation in Kansas, but merely an extension of standard practice with perhaps more emphasis placed on the work immediately adjacent to the structures.

The ease with which contractors are complying with the Kansas special backfilling requirements is shown in Fig. 7. Material is brought in by a carrying scraper and placed in position by a bulldozer. Compaction immediately against the arch barrel is by a rubber-tired tractor, while away from the concrete and over the gen-

Fig. 5. Securely braced forms for the arch barrels are reused at several locations. Precast concrete spreaders insure proper wall thickness.

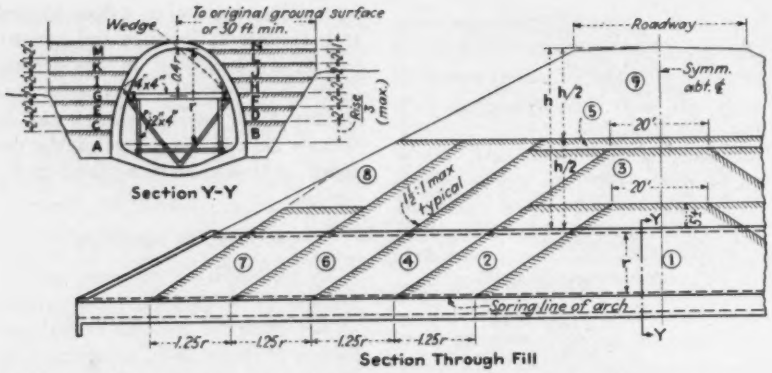


Fig. 6. Backfill is placed along arches on alternate sides in a controlled procedure to avoid undue stress in the arch ring. Timbers shown for interior bracing are minimum size permitted.

Fig. 7. Backfilling proceeds with clock-like regularity. Material is delivered by a carrying scraper, bulldozed into place, and compacted adjacent to arch barrel by a rubber-tired tractor. A sheepsfoot roller completes the compaction.

eral area a sheepsfoot roller does the tamping.

Proof that the total cost of unreinforced concrete arches compares favorably with reinforced concrete boxes was made at the beginning of the construction program. Contract for a ten-mile project had been awarded that included all reinforced concrete boxes. However, before work could be started the supply of reinforcing steel was shut off. Fortunately, this shortage of reinforcement had been anticipated and plans for unreinforced arches were quickly compiled. Relative quantities involved in the two types of structures showed the original box culvert designs required 1,334 cu. yd. of concrete and 152,000 lb. of reinforcing steel. The redesign with unreinforced arches eliminated all steel and yet increased the concrete quantity to only 1,567 cu. yd.

At a meeting of the Mississippi Valley Conference of State Highway Departments, held last January in Chicago, the attitude toward unreinforced concrete arch construction was that it probably could be profitably employed after the war in small sizes, especially where rock footings are available.

The fundamental principles of design for these unreinforced concrete arches were developed in co-operation with G. W. Lamb and E. S. Elcock, formerly bridge engineer and associate office bridge engineer, respectively, of the Kansas Highway Commission. J. R. Brown, junior engineer, computed most of the fundamental data.

Graphical methods used in developing intersection lines of collar with arch barrel, and also the procedure for computing concrete quantities will be covered in a subsequent issue.

Labor-Management Talks Speed Ship Construction

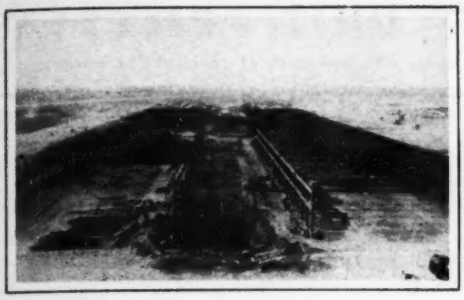
An example of the advantage to ship production schedules that comes from frank discussion by joint committees representing labor and management is afforded in reports from the Wilmington yard of the California Shipbuilding Corp. where weekly meetings are held for discussions of this sort.

Every Monday six Calship executives and seven representatives of employees discuss such problems as elimination of lost man-hours, methods of increasing production, improvement of parking facilities, group insurance, selective service and deferments and the weighing of differences to avoid grievances.

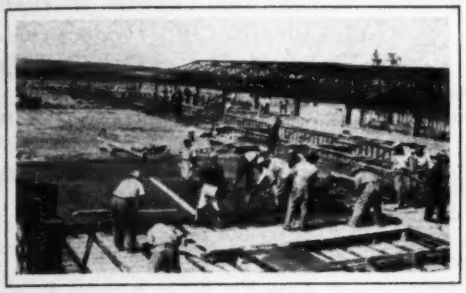
Discussions usually conclude with consideration of "ideas" submitted by employees and the award of war bonds (ranging up to $100 value) to those turning in the best suggestions. During a seven-month period in which the offer of rewards for useful ideas has been effective, more than 3,000 labor-saving and safety improvement ideas have been considered by the judges.

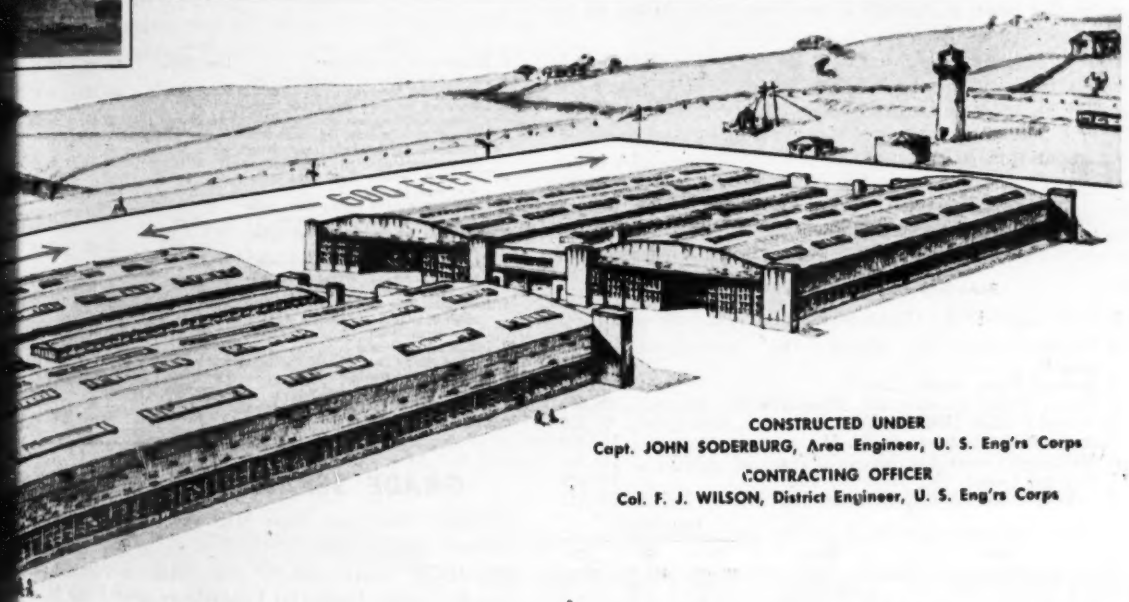
Removing Manganese in Water Supplies

Recurrences of manganese trouble have been experienced in nine Illinois municipalities this year, with the characteristic complaints of brown spots appearing during the laundering of clothes. According to the official bulletin of the State Department of Public Health the trouble was quickly eliminated in the majority of cases by raising the pH to about 9.0. At three supplies the manganese content was lowered satisfactorily by changing the depth of draft so as to draw water from near the surface of the reservoir. At Carrier Mills, however, it was necessary to raise the pH to 9.4 and to keep a chlorine residual from 0.3 to 0.4 ppm. in the mixing basin. Chlorine, as an oxidizing agent, helped oxidize the manganese to its insoluble form with the high pH, causing precipitation of the manganese. The bulletin warns that after manganese troubles have been corrected, the system and storage structures should be cleared of water high in manganese by thorough flushing.



Shots Taken Project Was Process Of Construction





CONSTRUCTED UNDER
Capt. JOHN SODERBURG, Area Engineer, U. S. Eng'rs Corps
CONTRACTING OFFICER
Col. F. J. WILSON, District Engineer, U. S. Eng'rs Corps

25,000 SQ. FT. *of* FLOOR SPACE *in* 92 Days!

together with **250,000** SQ. YDS. *of* **OUTSIDE CONCRETE PAVEMENT**

ONSTRUCTION COMPANY, INC.

UTIVE OFFICE: 220 EAST 42nd STREET, NEW YORK 17, N. Y.

NSYLVANIA OHIO MARYLAND DELAWARE NEW JERSEY

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

AIRPORT CONSTRUCTION, TEXAS

OWNER: Civil Aeronautics Administration, Fort Worth, Tex.

PROJECT: Clearing, grading, fencing, paving, conditioning and lighting at the El Paso Municipal Airport, El Paso, Tex. Includes preparation of site; constructing flexible base runways and taxiways, 9-in. caliche base course and 2-in. bituminous surface course with seal coat; and removing, replacing and installing new airport lighting equipment.

CONDITIONS: Government to furnish series flush type contact light with lens, filter and cover; series boundary light units; filters, contact light units; cable, both single and double conductor; cutout with special mounting straps; wind tetrahedron; runway selector relays; lamps; control panel; and transformer or other major vault unit if required. Contractor to furnish all other materials and complete work as follows: Schedule I, 90 calendar days; Schedule II, 150 calendar days; and Schedule III, 120 calendar days. Part of airport site must remain open for air training and traffic during the construction period. Highway and spur track of Southern Pacific Railroad available for transportation of materials. Wage rates are: skilled labor, $1.00 to $1.50 per hour; semi-skilled, 60 to 75c.; and common, 50c.

BIDS: Eight bids were opened August 20, 1943 on Schedule I ranging from the low of $71,780 to $134,721; eight bids were received on Schedule II on the same date, ranging from $733,800 to $1,526,450; and thirteen bids were received on Schedule III ranging from $27,296 to $65,592. On Schedule II an alternate was allowed on paving: 2-in. bituminous surface course, or 2-in. natural rock asphalt. Award recommended on former basis. One bid received on the latter, $804,570. Unit prices are tabulated below along with the list of bidders on each schedule.

Schedule I—Preparation of Site

LIST OF BIDDERS: (Engineers estimate, $90,540.)

1. Uvalde Constr. Co., Dallas, Tex. (recommended award) $71,780
2. Holland Page, Austin, Tex 86,450
3. Brazos Valley Construction, Mineral Wells, Tex 86,600
4. Brown & Root, Houston, Tex 93,800
5. A. O. Peabody, Santa Fe, N. M. 111,460
6. McKinney Constr. Co., Marshall, Tex 112,280
7. Gaylord Constr. Co., Houston, Tex 130,050
8. Lee Moor-Tanner Co., El Paso, Tex 134,721

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	250 ac.	$30.00	$40.00	$40.00
2. Grading (field excavation)	180,000 c. y.	.30	.30	.33
3. Fence Class D	700 l. rd.	1.60	2.00	3.00
4. New fence	400 l. rd.	2.75	3.50	3.50
5. Install 3-in. duct	18,000 l. f.	.52	1.00	.70
6. Concrete (1:2:4 mix)	20 c. y.	50.00	50.00	20.00
7. Rock excavation	100 c. y.	1.20	4.00	1.50
8. Conditioning surface	10 ac.	8.00	25.00	55.00

Schedule II—Paving

LIST OF BIDDERS: (Engineers estimate, $953,120.)

1. Uvalde Constr. Co., Dallas, Tex. (recommended award) $733,800
2. McKinney Constr. Co., Marshall, Tex 806,868
3. Lee Moor-Tanner Co., El Paso, Tex 812,789
4. A. O. Peabody, Santa Fe, N. M. 860,260
5. Brown & Root, Houston, Tex 898,910
6. Jay W. Craig Co., Minneapolis, Minn 933,130
7. Thomas & Ratliff, Rogers, Tex 1,357,810
8. Gaylord Constr. Co., Houston, Tex 1,526,450

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Base course aggregate	133,000 c. y.	$1.96	$2.25	$2.38
2. Asphalt base course	145,000 gal.	.11	.104	.117
3. Aggregate (bitum. mix) 2-in. surf. crse.	70,000 ton	4.15	4.74	4.47
4. Seal coat	5,000 ton	5.50	5.05	4
5. Asphalt, seal coat	150,000 gal.	.10	.10	
6. Caliche blanket (compacted shldrs.)	770,000 s. y.	.095	.10	
7. Prime coat, asphalt	192,000 gal.	.11	.10	
8. Seal coat, asphalt	154,000 gal.	.10	.104	
9. Seal coat, course sand	5,800 c. y.	2.50	.10	
10a. Caliche blanket (caliche area)	2,770,000 s. y.	.0865	1.40	1
11a. Prime coat, asphalt	700,000 gal.	.11	.16	
12a. Seal coat, asphalt	550,000 gal.	.10	.108	
13a. Seal coat, fine aggregate	14,000 c. y.	2.46	1.35	1

a—Denotes alternate item bids and quantities.

Schedule III—Lighting

LIST OF BIDDERS: (Engineers estimate, $45,400.)

1. Reynolds Electr. & Engr. Co., El Paso, Tex. (recommended award) $27,
2. Callaghan Electric, El Paso, Tex 31,
3. Schanche Construction, St. Louis, Mo. 32,
4. Lee Moor-Tanner Co., El Paso, Tex 33,
5. N. E. Busby, Dallas, Tex 34,
6. Sanford Constr. Co., Oklahoma City, Okla 37,
7. Empire Electric, Fort Worth, Tex 38,
8. Uvalde Constr. Co., Dallas, Tex 39,
9. Embry Electric Co., Brady, Tex 39,
10. Nola Electric, New Orleans, La 41,
11. Nelson Electric, El Paso, Tex 49,
12. Aaron J. Commer, Roanoke, Va 57,
13. William & Whittle, Dallas, Tex 65,

Item	Quan.	Unit Prices (1)	(2)	
1. Remove wind tee equipment	Lump Sum	$72.60	$40.41	$
2. Install wind direction tetrahedron, incl. bkfill, conc. base, etc	Lump Sum	205.13	58.30	
3. Disconnect, remove boundary light cones; replace at new location	30 ea.	12.43	10.36	
4. Inst. series disconnecting cone-type boundary lights, incl. conc. base, excavating, etc	56 ea.	16.50	19.46	
5. Disconnect, remove flood light units, with conc. base, etc	8 ea.	128.20	234.08	
6. Disconnect, remove contact light units with base; replace in new location	10 ea.	38.94	24.66	
7. Inst. flush type series contact lights, incl. conc. materials, etc	460 ea.	26.45	22.63	
8. Excavation, backfill trench, removing salvaging, sealing, coiling and marking exist. underground cable	11,000 l. f.	.1045	.11	
9. Excavating and backfilling trench for single or multiple installation of cable, min. depth 18-in	125,000 l. f.	.05	.08	
10. Install cable in trench	150,000 l. f.	.0173	.015	
11. Replace control panel	Lump Sum	166.82	200.00	
12. Install concrete manhole	Lump Sum	385.72	230.00	
13. Connect circuits	Lump Sum	442.96	2,200.00	
14. Rock excavation	200 c. y.	1.50	4.00	
15. Concrete (1:2:4 mix)	50 c. y.	16.98	12.00	

GRADE SEPARATION, MICHIGAN

OWNER: Michigan State Highway Dept., Lansing; L. Millard, bridge engr.

PROJECT: Construction of reinforced concrete grade sep tion on Detroit Industrial Expressway over Ford Motor C pany Gate No. 10, Dearborn, Wayne County, Mich. Requ two 30-ft. 3-in. and two 40-ft. 4½-in. continuous concrete beam spans. Roadway widths are 36-ft. and 24-ft. on north south superstructures, with 2½-ft. rolled curbs, and two ft. shoulders.

CONDITIONS: Contractor to furnish all materials and c plete work by Jan. 1, 1944. Poor soil conditions are expecte be encountered, and project is located in midst of defe areas with attendant labor shortages and high wages. Rail highway transportation facilities available. Wage rates skilled labor, $1.62½ to $1.67½ per hour; semi-skil $1.37½; and common labor, 90c.

BIDS: Seven bids were received August 4, 1943, ranging f the contract low of $174,787 to $227,611.

LIST OF BIDDERS:

1. Fry & Kain, Lansing, Mich. (contract) $174,
2. Darin & Armstrong, Inc., Detroit, Mich 176,
3. D. T. Frank, East Lansing, Mich 177,

If you were selecting a Loader for use at a JUNGLE AIRPORT...

[*Knowing that even if spare parts could be flown in, it would take weeks to get an order through . . .*]

Wouldn't you insist on a make of machine that had all clutches and gears enclosed in a dust-tight box and running in oil?

Wouldn't you want the simple, sturdy, revolving-propeller self-feeding device?

Wouldn't you seek a loader which used manganese steel for the sprockets, chain links and other abrasion-encountering parts?

Wouldn't you take a canny look at the elevator pivoting, and its raising and lowering device—for simplicity, foolproof-ness and ease of operation?

Wouldn't you want a slow-speed crowding drive that would keep the buckets digging out a heaping load at all times?

Wouldn't you look critically at the elevator boom for deep truss construction that would be sure to withstand overload with safety?

Wouldn't you give preference to the use of alloy steels for the various shafts and parts that take the brunt of the strains of heavy power applied to hard digging?

You'd have written a specification which automatically called for a Haiss Loader!

and why **SHOULD YOUR CHOICE BE ANY DIFFERENT IF YOUR WORK IS NEAR INSTEAD OF FAR AWAY?... MAXIMUM RELIABILITY IS STILL THE BIG FACTOR IN ENDING UP WITH LOW LOADING COSTS... MAKE IT A HAISS, NEXT TIME!**

GEORGE HAISS MANUFACTURING CO., INC., 140th ST. & RIDER AVE., NEW YORK 51, N. Y.

DISTRIBUTORS COAST TO COAST

●

Write, wire or phone for prices, catalogs and deliveries

HAISS

PORTABLE CONVEYORS ★ LOADERS ★ CLAMSHELL BUCKETS

4. W. J. Storen Co., Detroit, Mich 183,105
5. Couse & Westphal, Detroit, Mich 187,646
6. Charles Gosner & Co., Detroit, Mich 191,847
7. Peninsular Constr. Co., Grand Rapids, Mich 227,611

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Earth excavation	17,420 c.y.	$0.80	$0.80	$0.60
2. 18-in. Class B culvert	128 l.f.	5.00	3.50	3.00
3. 6-in. perforated sewer	484 l.f.	1.25	1.00	2.00
4. 6-in. sewer	88 l.f.	1.00	2.00	1.00
5. Borrow excavation (loose measure)	1,765 c.y.	.75	.70	.60
6. Overhaul	33,105 c.y. mi.	.15	.15	.20
7. Porous backfill, Grade A (compacted)	62 c.y.	3.00	3.00	3.00
8. Unclassified excavation (struct.)	4,225 c.y.	2.75	2.75	3.00
9. Timber piles (furn. and driven)	13,860 l.f.	.90	.86	1.00
10. Cutoff—timber piles	284 l.f.	.75	.75	.75
11. Treated timber piles (furn., drives)	19,272 l.f.	1.17	1.25	1.25
12. Cutoff treated timber piles	432 l.f.	.85	.85	.85
13. Grade B concrete substructure (6A)	780 c.y.	28.00	26.50	30.00
14. Grade B concrete substructure (6B)	608 c.y.	28.00	28.00	30.00
15. Grade B concrete sub-base (6A)	578 c.y.	20.00	16.00	20.00
16. Grade B conc. superstructure (6B)	535 c.y.	28.00	30.00	25.00
17. Heat and house superstructure conc.	535 c.y.	1.00	1.50	1.00
18. Cement	3,868 bbl.	2.00	2.20	2.00
19. Steel reinforcement	329,090 lb.	.0475	.05	.05
20. Rubbed surface finish	12,330 s.f.	.15	.20	.20
21. Bridge railing	599.7 l.f.	8.00	8.00	6.00
22. Heat and house bridge railing	599.7 l.f.	.50	1.00	.50
23. ¼-in. joint filler	710 s.f.	.40	.30	.50
24. ½-in. joint filler	840 s.f.	.50	.40	.50
25. ¾-in. joint filler	150 s.f.	.60	.50	1.00
26. Damp-proofing	6,000 s.f.	.05	.05	.10
27. Joint waterproofing	623 s.f.	.40	.30	.50

HIGHWAY AND BRIDGE, NEW MEXICO

OWNER: New Mexico State Highway Dept., Santa Fe; F. M. Limbaugh, state highway engineer.

PROJECT: Grading, minor drainage structures, one 16-ft. double-span concrete and steel bridge, ballast, base course surfacing, and miscellaneous construction on State Highway No. 4 between Otowi and Los Alamos, in Santa Fe and Sandoval Counties, New Mexico. Approximate length of project is 6.3 miles.

CONDITIONS: Contractor to furnish all materials and complete work in 90 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 90c. to $1.50 per hour; semi-skilled, 60 to 80c.; and common, 45c.

BIDS: Three bids were received August 14, 1943, ranging from the contract low of $367,732 to $479,848.

LIST OF BIDDERS:

1. Lowdermilk Bros., Denver, Colo. (contract) $367,732
2. Henry Thygesen & Co., Albuquerque, N. Mex 383,907
3. Allison & Armstrong, Roswell, N. Mex 479,848

Road Items

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	Lump Sum	$950.00	$400.00	$1,250.00
2. Removal of obstructions	Lump Sum	415.00	1,000.00	750.00
3. Excavation, unclassified	280,000 c. y.	.80	.78	1.12
4. Excavation, for structures	848 c. y.	2.00	2.00	3.00
5. Excavation, for pipe culverts	2,454 c. y.	2.00	3.00	2.50
6. Overhaul	426,000 sta. y.	.02	.035	.03
7. Haul (quarter-mile yards)	30,000 ½-mi. y.	.08	.09	.08
8. Rolling, steel-tired roller	194 hr.	6.00	6.00	5.50
9. Rolling, sheepsfoot roller	2,912 hr.	5.00	5.50	4.25
10. Hand laid rock embankment	4,200 c. y.	1.80	2.00	4.00
11. Watering	3,576 M gal.	3.00	3.50	5.50
12. Class B concrete	5 c. y.	35.00	30.00	30.00
13. Class A concrete	283 c. y.	35.00	24.00	34.00
14. Reinforcing steel	14,604 lb.	.08	.09	.11
15. Mortar rubble masonry	138 c. y.	30.00	22.00	18.50
16. Std. rein. conc. pipe culvert, 18-in.	520 l. f.	4.00	4.00	4.00
17. Std. rein. conc. pipe culvert, 24-in.	1,818 l. f.	5.00	5.00	5.25
18. Std. rein. conc. pipe culvert, 30-in.	1,254 l. f.	6.00	5.50	6.50
Std. rein. conc. pipe culvert, 36-in.	516 l. f.	7.50	7.00	8.50
Std. rein. conc. pipe culvert, 42-in.	296 l. f.	12.00	14.00	12.00
Dry rubble, retaining wall	460 c. y.	12.00	4.00	11.00
22. Obliterating old road	1,203 mi.	150.00	200.00	300.00
23. Base crse, surfacing (No. 1 aggregate)	16,520 ton	1.00	.78	1.20
24. Ballast	28,030 ton	.90	.60	.90
25. Mechanical tamping	635 hr.	4.00	3.00	2.75
26. Remove and rebuild cattle guards	Lump Sum	300.00	400.00	800.00
27. Boulder car stops	940 ea.	2.50	4.00	7.50
28. Contour ditches	1,000 l. f.	.10	.80	.10
29. Install salvaged corr. met. pipe, 24-in.	50 l. f.	2.00	3.50	3.00

Bridge Items

Item	Quan.	Unit Prices (1)	(2)	(3)
Excavation, for structures	490 c. y.	$2.50	$2.50	$5.00
2. Class A conc.; superstructure	59.45 c. y.	40.00	26.00	31.50
3. Class B conc.; substructure	391.22 c. y	30.00	22.00	24.50

HIGHWAY BRIDGE, NEW MEXICO

OWNER: New Mexico State Highway Dept., F. M. Limbaugh, engineer.

PROJECT: Construction of concrete and timber bridge across Pecos River in Eddy County, N. Mex., between Loving and Potash Mines. Structure made up of fifteen 50-ft. spans. Alternate bids were asked on treated and untreated timber bridge; contract awarded on basis of treated timber construction.

CONDITIONS: Contractor to furnish all materials and complete job in 125 weather working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.50 per hour; semi-skilled, 60 to 80c.; common labor, 45 to 55c.

BIDS: Two bids were received July 6, 1943, the contract of $145,331, and $167,750 for the treated timber alternate; the low of $131,956, and $162,735 for the untreated timber alternate. Engineers estimate $124,807.

LIST OF BIDDERS: (Treated timber, basis of award)

1. J. H. Ryan, Albuquerque, N. Mex. (contract) $145,
2. Frank M. Kenney, Denver, Colo 167,

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, unclassified	125 c. y.	$1.00	$0.80	
2. Excavation for structures	2,070 c. y.	8.00	10.00	
3. Class B concrete	1,735.57 c. y.	30.00	32.00	
4. Reinforcing steel	4,466 lb.	.10	.08	
5. Mechanical tamping	150 hr.	6.00	5.00	
6a. Untreated timber superstructure	334.365 M bm.	185.00	250.00	
6b. Treated timber superstructure	334.365 M bm.	225.00	265.00	

* *Engineer's estimate. Items 6a and 6b are alternate bids for timber superstructure.*

STREET PAVING, BALTIMORE, MD.

OWNER: City of Baltimore, Md.; Wm. N. D. Fischer, acting highway engineer.

PROJECT: Sheet asphalt paving, on 8-in. cement concrete base, Ashburton Street from Rayner Avenue to Lafayette Avenue, Baltimore, Md. Length of project 678 feet; width 40 feet.

CONDITIONS: Contractor to furnish all materials and complete work in 25 working days. Highway transportation facilities available to site of work. Wage rates are: skilled labor $1.00 per hour; semi-skilled, 85c; and common, 75c.

BIDS: Four bids were received August 18, 1943, ranging from the low of $25,637 to $28,335.

LIST OF BIDDERS:

1. American Paving & Contracting Co., Baltimore, Md. (low bidder) $25,
2. Baltimore Asphalt, Block & Tile Co., Baltimore, Md. 25,
3. National Paving & Contracting Co., Baltimore, Md. 27,
4. P. Flanigan & Sons, Inc., Baltimore, Md 28,

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grading and sub-grade shaping	4,050 c.y.	$1.75	$1.80	
2. Pl. cem. conc. curb (6-in. wide, 20-in. deep)	1,400 l.f.	1.04	1.06	
3. Cem. conc. sidewalk (5-in. depth, incl. grad.)	50 s.y.	2.80	2.75	
4. Cem. conc. paving (8-in. deep; std. cement)	60 s.y.	2.80	2.75	
5. Cem. conc. base crse. (8-in. deep; std. cem.)	3,400 s.y.	2.74	2.75	
6. Cem. conc. base crse. (8-in. deep; HES cem.)	50 s.y.	2.96	3.00	
7. Cem. concrete base course (std. cement)	10 c.y.	12.36	13.00	
8. Cem. conc. headers (6-in. wide, 11-in. deep)	50 l.f.	.80	.75	
9. ½ x 8-in. expan. joint filler (fiber or equal)	50 l.f.	.32	.35	
10. ½ x 5-in. bitum. expansion joint	200 l.f.	.23	.25	
11. ½ x 8-in. bitum. expansion joint	1,430 l.f.	.31	.31	
12. Sheet asphalt paving (1½-in. wearing surface; 1½-in. binder course)	3,250 s.y.	1.69	1.75	
13. Binder, complete in place	5 ton	8.90	9.00	
14. Vitr. brick (2½-in. deep) gutters, ½-in. sand cement bed, cement grout filler	190 s.y.	3.65	3.75	
15. 6-in. underdrain pipe	100 l.f.	1.15	1.25	
16. Topsoil	10 c.y.	5.40	6.00	
17. Cold patch	10 c.y.	10.80	11.00	
18. Stone dust or screenings (1-in. depth)	100 s.y.	.14	.15	
19. 4-in. terra cotta drain pipe	10 l.f.	.80	.70	

The International TD-18 Diesel TracTracTor "on the march"... to bring Victory closer and to speed the day when big crawlers like this can resume the reconstruction jobs of Peace.

Riding on to War—and VICTORY with INTERNATIONAL TracTracTors

THE RUMBLE of America's motorized equipment grows louder and louder as the Allies press home the attack on battle fronts all over the world. It's "Onward, Mechanized Soldiers," with International TracTracTors joining in the March to Victory.

These big crawlers of the Armed Forces are giving the same superior performance that civilian TracTracTors are providing at home. That's one reason why there are so many of them in the Service. They are *doing the job.* They have the ruggedness, stamina, and the dependability it takes for the heavy-duty, push-and-pull jobs of war... both here and abroad.

With so many TracTracTors needed by the Armed Forces, there naturally are fewer available for civilian use. Your present TracTracTors will probably have to last for the duration. This calls for watchful, eagle-eye attention to care and maintenance. Make International Service—available at well-equipped, well-manned International Industrial Power dealers' shops—your ally in keeping your equipment working.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

Buy War Bonds... Save and Serve America

INTERNATIONAL POWER

Adams
DISTRIBUTORS
Headquarters for
MACHINERY and SERVICE

ALA.... Montgomery—Ray-Brooks Machinery Company
Birmingham—Tractor & Equipment Company
ALASK.. Fairbanks—Glenn Carrington & Company
ARIZ.... Phoenix—O. S. Stapley Company
ARK.... Little Rock—Little Rock Road Machinery Co.
CALIF.. San Francisco & Los Angeles—J. D. Adams Co.
Redding—J. G. Bastain
COLO.. Denver—McKelvy MachineryCompany
CONN.. New Haven—W. I. Clark Company
D. C.... Washington—Paving Supply & Equipment Co.
FLA.... Jacksonville & Miami—Florida Equipment Co.
Tampa—Orange State Motor Co.
GA..... Atlanta—Tri-State Culvert & Machinery Co.
IDA.... Boise & Pocatello—Intermountain Equipment Co.
ILL..... Peoria & Springfield—A. E. Hudson Company
Salem—Glasco Tractor & Equipment Company
Chicago—Great Lakes Supply Corp.
IND.... Indianapolis—J. D. Adams Company
Newburgh—Matt W. Foster
IOWA... Des Moines—Herman M. Brown Company
KANS... Wichita—S. H. Denney Road Machinery Co.
KY..... Louisville—Brandeis Machinery & Supply Co.
LA..... Baton Rouge—Industrial Tractor & Equip. Co., Inc.
MAINE.. Portland—Maine Truck-Tractor Co.
MD.... Baltimore—Paving Supply & Equipment Co.
MASS... Newton Highlands—Tractors, Inc.
MICH... Bark River—Bark River Bridge & Culvert Co.
Detroit & Grand Rapids—J. D. Adams Company
MINN... Minneapolis & Duluth—Thorman W. Rosholt Co.
MISS.... Jackson—Mississippi Road Supply Co.
MO..... St. Louis—Missouri-Illinois Tractor & Equip. Co.
Kansas City—Noel V. Wood, Inc.
MONT.. Billings—Industrial Equipment Company
NEB..... Omaha—Nebraska Tractor & Equipment Company
NEV..... Reno—Allied Equipment, Inc.
N. H.... Chester—R. C. Hazelton Co.
N. J.... Trenton—Ross, Young, Dilts Corp.
N. M.... Albuquerque—McChesney-Rand Equip. Co., Inc.
N. Y..... Groton—Clapp Machinery Company
Buffalo—Dow & Company, Inc.
Brooklyn—Edward Ehrbar, Inc.
Long Island—George Malvese & Co.
Albany—Slade Tractor Co., Inc.
N. C..... Raleigh—J. B. Hunt & Sons
N. D.... Fargo—Myhra Equipment Company
OHIO... Cleveland—Gibson-Stewart Company
Cincinnati—H. P. Kelly Equipment Co.
Cambridge—C. E. Major
OKLA... Tulsa & Guthrie—C. L. Boyd Company, Inc.
ORE.... Portland & Eugene—Howard-Cooper Corporation
PA..... Butler—National Culvert & Equipment Co.
Pittsburgh—Russell Pipe & Foundry Company
Camp Hill—L. B. Smith, Inc.
R. I..... Providence—Tractors, Inc.
S. C..... Columbia—N. H. Summers Road Machinery Co.
S. D.... Sioux Falls—Empire Equipment Company
TENN.. Knoxville—Brooks Equipment & Mfg. Co.
Nashville—Industrial Tractor & Equipment Co., Inc.
Memphis—Road Builders Equipment Co.
TEXAS.. Dallas & Houston—Browning-Ferris Machinery Co.
San Antonio—Jess McNeel Machinery Co.
Plainview—Plains Machinery Company
UTAH... Salt Lake City—The Lang Company
VT..... Montpelier—Vermont Road Equipment Co.
VA..... Richmond—Municipal Sales Company
Roanoke—Roanoke Tractor & Equipment Corp.
WASH.. Spokane, Seattle, Walla Walla—
Howard-Cooper Corporation
W. VA.. Charleston—Charleston Tractor & Equipment Corp.
WIS.... Eau Claire—Bark River Bridge & Culvert Co.

SEE **Adams**
AD ON OPPOSITE PAGE

NEW AIDS TO THE CONSTRUCTOR

Prefabricated Shower Stall

Of rugged construction, quick and easy to erect, a newly developed prefabricated shower stall provides bathing facilities in housing, factories, army camps and institutions. Approved by the Federal Public Housing Authority, the shower stall has a steel frame and crown, finished in baked-on enamel. The walls are of natural finish cement-asbestos board. Said to be unusually strong and rigid, the shower unit is well within the limits set by the War Production Board.

A steel-reinforced concrete receptor provides a rigid and waterproof shower base. All joints are tightly held by self-tapping screws or bolts. When erected, the prefabricated shower stall has the quality of a solid, one-piece structure. It is shipped knocked down.—*Barclay Manufacturing Co., 385 Gerard Ave., Bronx, N. Y.*

Tire-Bead Loosener

The tough service problem of loosening truck tire beads from the rims has been solved, it is claimed, by a new tool that can handle tires of virtually any size, including huge earth-mower varieties, with ease and speed. Compact and light, the tool originally was developed for airplane tires; it now has been tested for truck tire usage, and a new technique of dismounting has been developed which is much simpler than that necessary with airplane tires.

The bead loosener is a metal bar hooked at one end, with an adjustable lever attached near the straight end of the bar, and two adjustable hooks. With the tire laid flat and deflated, the tool utilizes a system of hooks and leverage to force the bead loose from its rim quickly. The tool is in a kit 38x6x6½ in., weighing only 48 lb. The kit also contains a valve holder, valve repair tool, valve extension, tire irons, a rubber-and-metal hammer, and a strap. One man, it is said, can easily mount a tire, using only the equipment in the kit.—*The Firestone Tire and Rubber Co., Akron, Ohio.*

Decorative Masonry Protection

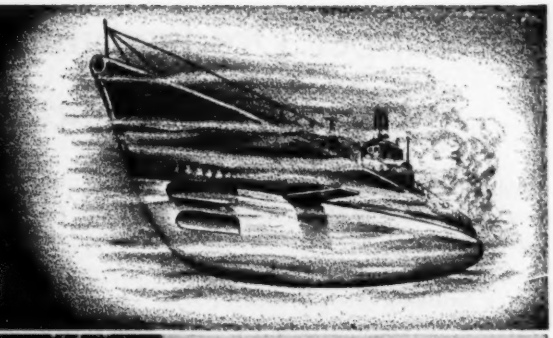
Started ten years ago, a decorative, water-resistant treatment for exterior masonry surfaces has just been released for general use. This coating, called "Waterfoil," has the equivalent thickness of three or four coats of average paint, the manufacturer claims, and comes in five basic colors. It contains no critical materials.

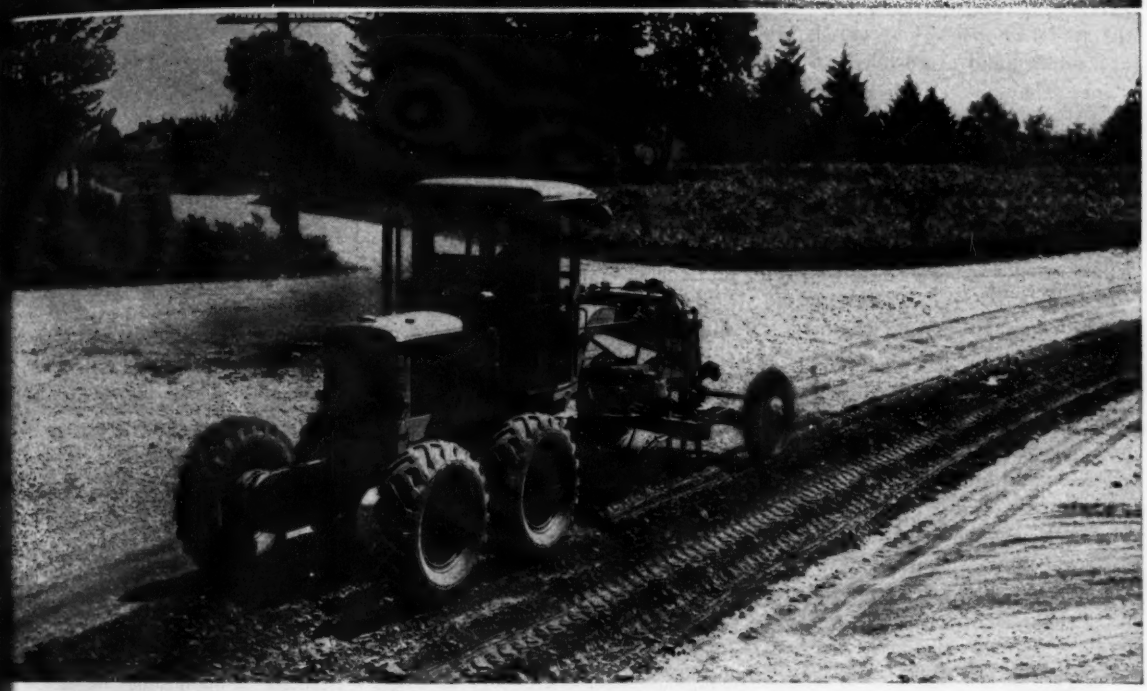
This protective treatment is an application of irreversible, inorganic gels, which practically "weld" themselves into the minute voids of masonry materials. This substance, hardened into a heavy, spongelike coating, is said to impede penetration of water from outside, but will permit the escape of water vapor developed by abnormal temperatures.—*A. C. Horn Co., 43-46 Tenth Street, Long Island City 1, N. Y.*

Cooler-Dehumidifier

Designed to conserve time and manpower in essential war tasks, a new mobile cooler and dehumidifier, for use by the armed forces, is in production. The new equipment, self-contained and weighing about 600 lb., is highly mobile and can be wheeled like a baby carriage on hard surfaces. It has retractable wheels and a sled-like bottom with rings attached for towing through sand or over soft

Balanced WEIGHT DISTRIBUTION





TO KEEP YOUR GRADERS ROLLING FOR VICTORY...

- ✓ Check condition of engine regularly.
- ✓ Change lubricating oil and renew filter elements every 100 hours of use.
- ✓ Lubricate all parts of grader regularly.
- ✓ Service air cleaner every 10 hours of use.
- ✓ Clean fuel oil filters at least every 60 hours.
- ✓ Don't ride clutch. Adjust clutch pedal when and as needed.
- ✓ Keep electrical system in good condition —check battery regularly.
- ✓ Keep lost motion out of grader—use adjustments for wear and replace parts worn out.
- ✓ Keep tires inflated to recommended pressure.

If you need help or advice on any of the above, see your local Adams distributor.

THE QUICK DIVING and surfacing maneuvers required of submarines call for carefully planned *balance of weight distribution!* . . . Equally important to the efficiency of an Adams Motor Grader is its built-in *balanced weight distribution*—the product of careful and intelligent engineering . . . Adams balance gives enough weight on the rear wheels to provide traction that will utilize all the engine's power *plus* ample weight on the front wheels to hold them in line against skidding. Also sufficient pressure can be exerted on both blade and scarifier to cut any material a motor grader can handle . . . *Balanced weight distribution* is but one of the many Adams features you will like when once again you are permitted to buy equipment for use on peace-time projects!

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

Adams motor graders, leaning wheel graders, elevating graders, hauling scrapers, tamping rollers, bulldozers and road maintainers are used by allied forces throughout the world.

Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

Hopper Dredge Suction Line Intake *Has Unique "Nozzle"*

Improving and maintaining the harbors and channels of our coasts and rivers calls for dependable dredging equipment. Numerous sturdy, seagoing hydraulic hopper dredges are performing gigantic tasks, keeping the sea-lanes open. These vessels are excavating and transporting machines. They are self-contained, self-propelled, steamer-type with moulded hulls, built to operate without anchorage in deep water locations subject to rough weather conditions.

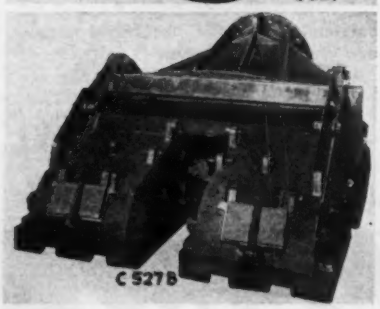
Logically, parts of Amsco manganese steel are frequently specified for dredging equipment used by the government and private companies.

Illustrations C-527 and C-527-B show a complete adjustable channel drag, weighing about 7700 lbs., used on a government owned and operated hydraulic hopper dredge. The body of this drag is of carbon steel. The shoes and bottom grates are of wear-resisting manganese steel. It is the inlet mouth-piece nozzle of a suction pipe line. In service, with the dredge at the shoal site and slowly propelled ahead at about 1½ knots, the suction line is lowered, trailing aft, with the drag on the bottom, while the dredge pump is operating. The drag digs a furrow in the sand and sediment, acting in much the same manner as a vacuum cleaner.

The drag construction incorporates maximum sturdiness throughout to cope successfully with the unusual, unseen, below water-level conditions encountered. The choice of manganese steel has been justified, in the ability of the wearing parts to withstand the attrition of the intensely abrasive material picked up.

C-527-A is a bottom view of the channel drag, showing a protective coating of Amsco No. 459 hard-facing welding rod applied to the areas of the scraper and grating castings where the most severe friction is encountered, assuring added abrasion resistance. The hard-facing treatment can be renewed as occasion demands, or there is still the parent manganese steel to withstand the wear.

Send for bulletin on Amsco Dredge Pumps, Pipe Line Fittings and Rotary Cutters.

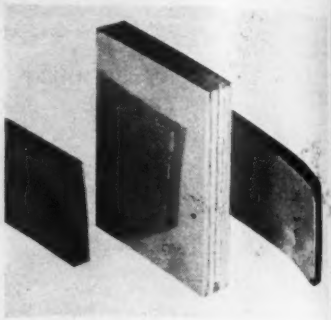


Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

ground. A minimum of critical materials is used in its construction.

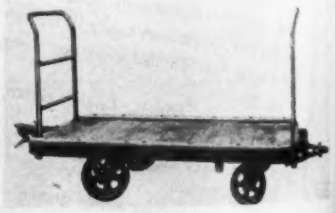
Besides cooling hot airplane interiors, dark rooms, field hospitals and the like, it is claimed that the cooler equipment prevents rust and mildew, and removes dust from the air, because it combines dehumidifying, filtering and circulating air with its temperature-reducing properties.—*Carrier Corporation, Syracuse, N. Y.*



Adhesive Bonding Process

Thin sheets of metal may be joined to plywood with a bond stronger than the materials themselves, according to a recent announcement. The new method, already in wartime use, is expected to find numerous peacetime applications in the bonding of metal to metal; rubber, synthetic rubber, plastics, leather or wood to metal; or to each other.

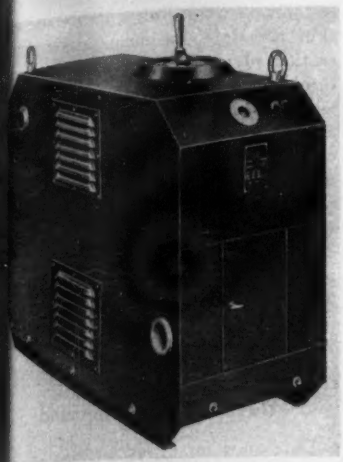
The bond is said to be unaffected by fresh or salt water; and is extremely resistant to vibration fatigue. The process is simple in application, the surfaces being brushed, sprayed or dipped with the bonding mixture, joined and dried for an hour, after which mild heat and pressure are applied. Available promptly for essential end uses, this material is shipped in 1-, 5- or 55-gallon containers.—*The United States Stoneware Co., Akron, Ohio.*



All-Purpose Trailer

To fill many industrial uses, a new trailer, Model 610, has a standard automatic hitch, although a manually operated type is optional. The trailer frame is of 3 x 2½ x 5/16 in. T-iron, reinforced by two longitudinal angles. Floor boards are of 1½-in. dressed hardwood. Rear axle brackets and other castings are of

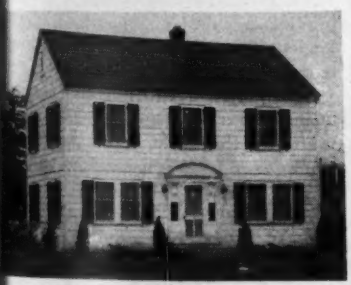
st steel. The trailer racks are interangeable on sides or ends. — *Manuactured by Rose Mfg. Co.; sold exclusively by H. L. Pitcher Co., Strathmoor & Fullerton, Detroit, Mich.*



Alternating Current Welder

A "war baby" heavy-duty, manually-perated alternating current welder has een engineered for constant, heavy use war production plants. Model GR 49 as a large margin of safety to handle ntinuous welding loads, due to an versized core working at low flux densiies. Two open circuit voltages give a ide variety of applications, particularly r heavy plate welding, within the maine's output range of 100-675 amperes. he welder remains cool at work, meetg N.E.M.A. temperature rise specificaons without operating its forced venlation system, which, however, is availble for extra coolness.

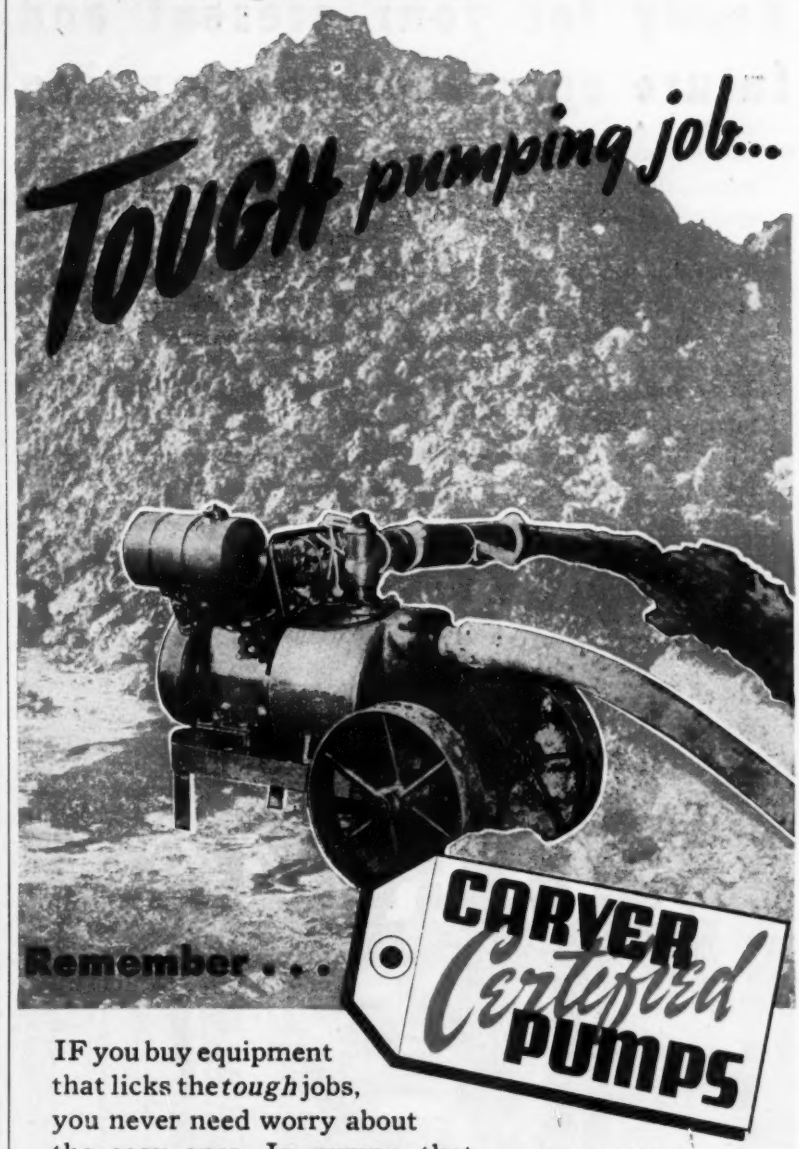
Contactor with push-button control for ower is provided, and Model GR 49, hich handles rod from ⅛ in. to ⅝ in. diameter, can be converted from hand automatic operation.—*Glenn-Roberts o., 1009 Fruitvale Ave., Oakland, Calif.*



Postwar House

Looking actively toward the future, a oncern now engaged in producing airraft assemblies and other war products making plans to produce prefabricated ouses in the postwar period. An experi-

Whenever you face a



Model A-25212 (10,000 GPH) on a tough airport dewatering job.

IF you buy equipment that licks the *tough* jobs, you never need worry about the easy ones. In pumps, that means CARVER—the pump designed, built and performance-proved for the really tough pumping jobs. Sizes run from 3,000 to 125,000 GPH. See your distributor for details—NOW!

THE CARVER PUMP CO.
Muscatine, Iowa

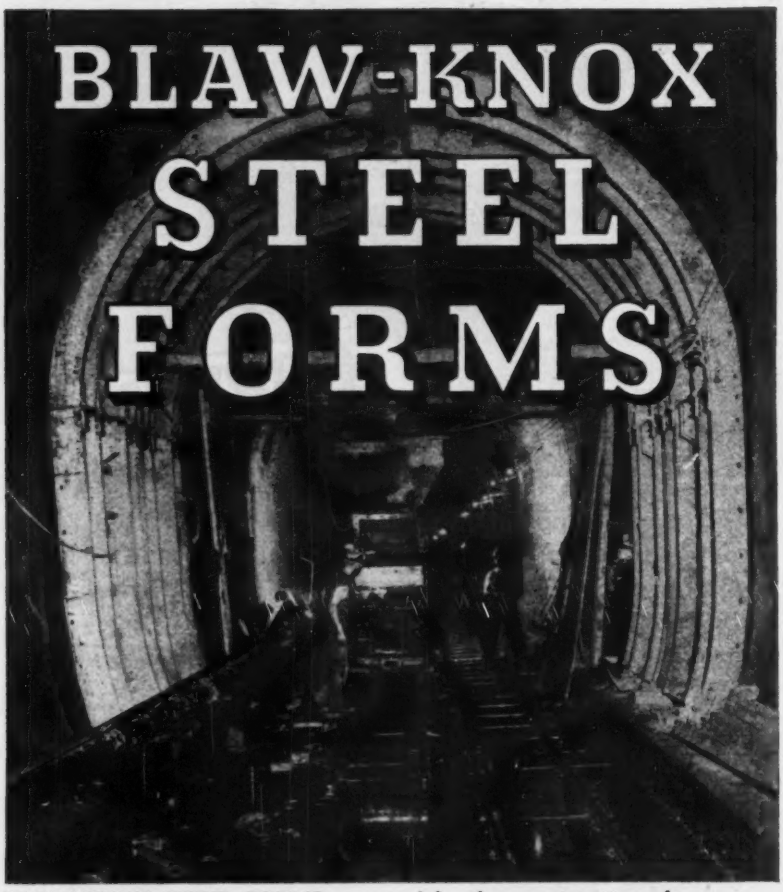
CARVER CENTRIFUGAL Certified PUMPS

Ready for your present and future construction planning

Blaw-Knox Steel Forms are designed for speed and economy in construction, and contractors have for many years utilized our specialized engineering service to plan their jobs.

Current construction work of a sufficiently urgent nature can be served, and long range planning for the proper handling of future jobs can be aided by experienced Blaw-Knox engineers.

The engineering facilities and services extended by Blaw-Knox form engineers are prized by all who have taken advantage of them. This service is offered in the interest of engineering progress and is free from any charge or obligation.



BLAW-KNOX STEEL FORMS are used for the construction of
TUNNELS WALLS SEWERS DAMS BRIDGES PIERS
CONDUITS ROADS SEWAGE DISPOSAL PLANTS . . .
. . . and other varieties of concrete construction

BLAW-KNOX DIVISION of Blaw-Knox Co.
2001 FARMERS BANK BUILDING PITTSBURGH, PA.
NEW YORK • CHICAGO • PHILADELPHIA • BIRMINGHAM • WASHINGTON

mental house has been developed, with dry-wall construction throughout, using southern hardwood Mengelbord panels in various designs.

A scarfed joint, adapted from airplane construction, will be used for walls and ceilings. This utilizes fully the stressed-skin principle, the manufacturer states, so that plywood can be used as a structural member. Flush wall construction will eliminate batten and furring strips and nails, and is readily adapted to field construction. It is now planned that plywood load-bearing walls will be finished with hardwood panels, or wallpaper, without fear of cracks. Mengel flush doors in plain interior finishes, and oak plywood floors blend well with the colonial design. A plywood Kemper cabinet is part of the kitchen equipment.—*The Mengel Co., Louisville, Ky.*

Dust-Laying Compound

Developed for laying airport dust is a new compound, described as a stable, homogeneous liquid of relatively low viscosity, which may be diluted or extended with water in all proportions. This composition is said to be effective in wetting and penetrating all types of soil; it may even be applied to a muddy surface immediately after rain.

As a new type of emulsifier is used, the oil will wet only the top two inches of soil; it becomes water-insoluble on further penetration. Thus the compound is not dissolved and leached away by subsequent rain. It is also stated to be safe and easy to handle, non-corrosive, and a weed-killer.—*Curran Corp., 6 Pleasant St., Malden, Mass.*

Cable Clamps for Exposed Wiring

Mass machinery installations in modern war plants require flexibility in arrangement and mounting of exposed industrial wiring. New cable clamps to meet this need have been announced. These malleable iron clamps, it is stated, provide a suitable support for branch feeders from the main distribution system.

The quarter-bend cable clamp is said to insure proper bending radius without injury to the cable, while the mooring clamp is used to anchor the cable at supply and output ends without undue strain on the cable line.—*Appleton Electric Co., 1701-1729 Wellington Ave., Chicago, Ill.*

Plastic Envelopes

Blueprints, charts and record forms, protected by cellulose acetate plastic envelopes recently made available, are kept clean, neat and visible at all times. Bound leatherette edges prevent this "Klear-Vu" envelope from tearing; po-

WHY *Two* ENGINES?

★

FOR

FASTER HOIST... FASTER SWING!

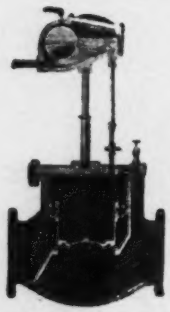
Yes, by having one space-saving Page Horizontal Diesel Engine for the hoist and the second providing power for the electric swing—the result is GREATER SPEED THROUGHOUT THE DIGGING CYCLE . . . MORE DIRT MOVED PER SHIFT! On tough War Jobs—the records show that Page TWO-ENGINE Draglines are SAVING TIME, LOWERING COSTS and INCREASING PRODUCTION—NOW, when we need it most!

Write or Wire for full details

PAGE • *Two-Engine* • DRAGLINES

PAGE ENGINEERING COMPANY • CHICAGO, ILLINOIS

Where Water Control is Vital
SPECIFY
GOLDEN-ANDERSON
SPECIALTY VALVES

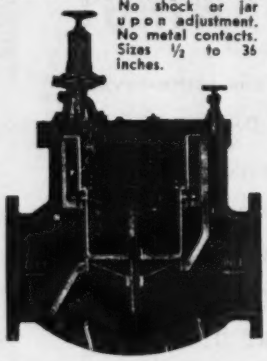


Controlled Float Valve

Maintains water level within 1" variation. Suitable for closed or open tanks, etc. Furnished without self contained float chamber, if desired. Air and water cushioned.

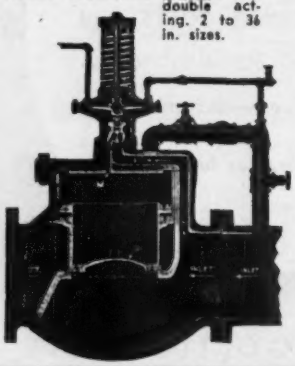
Water Reducing Valve

Gives constant terminal-delivery pressure under varying demands. No shock or jar upon adjustment. No metal contacts. Sizes ½ to 36 inches.



Altitude Control Valve

Maintains water levels within 3 to 12 in. variation. Differential control permits delayed valve opening for any depth tank. May be fitted for electric control or remote operations. Single or double acting. 2 to 36 in. sizes.

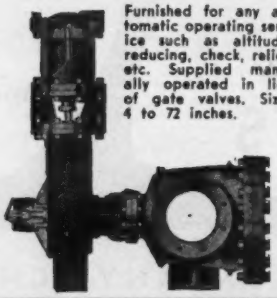


• Avoid valve breakdowns and consequent service delays by regular and frequent inspection . . . and where continuous service with no down-time is essential install GOLDEN-ANDERSON Specialty Valves. There is a G-A Specialty Valve type and size for every service. Illustrated here are a few of the many G-A Waterworks Valves. For more information write for our new catalog, containing complete descriptions of all G-A Specialty Valves.

GOLDEN-ANDERSON
VALVE SPECIALTY COMPANY
1300 FULTON BLDG. PITTSBURGH, PA.

Cone Thru-Flow Valve

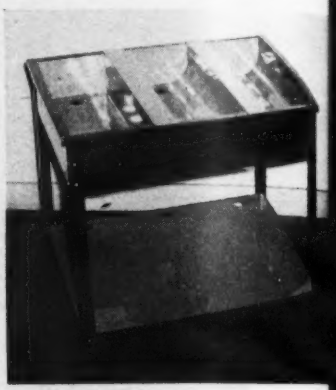
Furnished for any automatic operating service such as altitude, reducing, check, relief, etc. Supplied manually operated in lieu of gate valves. Sizes 4 to 72 inches.



tented lock-stitch on bonding will not unravel, and the envelope is flame, moisture and oil-proof. The standard size of the envelope is 10x12½ in., but various sizes can be made for special needs, and eyelets or straps can be provided where required. A free sample is available.—*American Plastic Products, 533 S. Western Ave., Los Angeles, Calif.*

Photo Trays and Stands

Easy to ship and assemble, newly designed porcelain-enameled trays and stands are an attractive addition to blueprinting and photographic developing



equipment. The trays have either oval or flat bottoms. Trays and shelf are enameled bright green, from a special formula of vitreous enamel to withstand corrosion by fixing and developing solutions. The balance of the stand is in black, high gloss porcelain finish. This equipment is made in all sizes to meet specific requirements.—*The Erie Enameling Co., Erie, Pa.*

Payroll Expediter

The burden of payroll work is eased according to the manufacturer's statement, when the new "Form-master" form holding device is used. Speed is attained, too, as employees' checks or cash payroll statements, payroll summary sheets and individual earnings records are posted simultaneously. — *Todd Co., Inc., Rochester, N. Y.*

Carbon Copy Pencil

Said to be 25 to 75 percent stronger than ordinary pencils, Reliance multiple carbon copy pencil No. 700 can make five or six legible carbon copies without cutting through the top copy. A special process of bonding wood with special patented lead accounts for the strength of this pencil, which is smooth-writing and legible, easy to erase and hard to smudge. A sample pencil will be sent to inquirers using a business letterhead.—*Reliance Pencil Corp., Mt. Vernon, N. Y.*

INDIAN FIRE PUMPS

STOP FIRES BEFORE they get beyond control!

The increasing amount of wood construction work makes it advisable to have an ample supply of famous INDIAN FIRE PUMPS on hand. These low priced, portable fire fighters are your best fire insurance policy. Thousands in use. Protect your investment in time, money and materials. Order INDIANS now and be prepared for the unexpected. Fire gives no warning.

D. B. SMITH & CO.
426 Main St., Utica, N. Y.

Pacific Coast Branch
Hercules Equipment & Rubber Co.
535 Brannan St., San Francisco, Cal.

Large filler opening permits filling tank at ANY water supply. NO CHEMICALS USED. Strainer prevents entrance of leaves or rubbish into pump.

5 gal. tank is rust proof. Curved in shape to fit the back, it can be carried with ease. Ventilation feature prevents dampness touching the back.

Easy pumping throws powerful 30 to 50 ft. pressure stream. Nozzle may be instantly adjusted to a spray. Just the thing for building, roof, rubbish and grass fires.

With tank slung on back operator has complete freedom of arms and can move about quickly in fighting the fire. Carrying straps are adjustable like a soldier's pack. No need to drag the extinguisher from place to place.

Send for catalog giving prices and full details

ERROR-PROOF COPIES
in a *Jiffy*

Photo-exact copies for your office, shop, branch or distant plant are made fast and at low cost with A-PE-CO. One copy or a hundred in jig time — and A-PE-CO can't make mistakes. Copies directly from blueprints.

A-PE-CO "*Photo Exact*"

PHOTO-COPYER $55.00 .... Non-Fading Photo-Copies of letters • documents • records • blueprints • pictures • drawings

Same-size copies of anything up to 18" x 22". Accepted as legal evidence. Eliminates stenocopying, tracing, proof-reading. Photo-copies direct from blueprints, graphs, tracings, telegrams, receipts, shop orders — anything written, printed, drawn, photographed. Endless uses for A-PE-CO. Needed by *all* departments. Big savings. Thousands in satisfactory use.

No Camera — No Darkroom Low Cost

Simple, fast. No focusing. Conserves man-hours. Any office employee quickly becomes expert. Low cost per copy, lowest investment in equipment. Saves other equipment. Put A-PE-CO on any available desk or table. Immediate delivery. Representatives in principal cities and Canada. Write for A-PE-CO folder.

AMERICAN PHOTOCOPY EQUIPMENT CO.
Dept. EA-9
2849 N. Clark St. Chicago 14, Illinois

Fight WITH WAR BONDS

MANUFACTURERS' ACTIVITIES

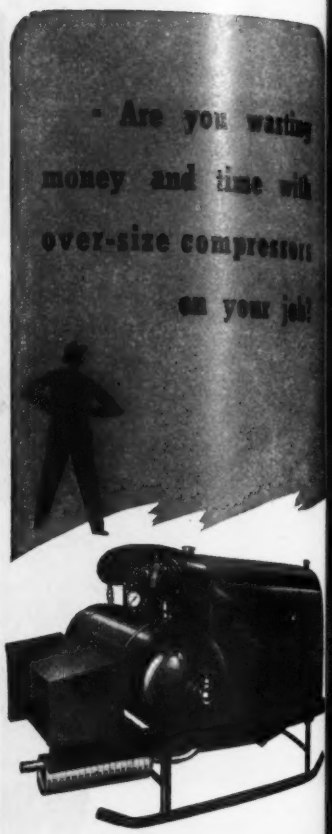
HOMESTEAD CORP., Hartford, Conn., which operates the Hartford Cement Co., the Homestead Insulation Co., and the Windsor Cement Co., has acquired the one-story brick plant occupied by the Elias Glass Co., 45 Granby St., Hartford, Conn., and will occupy it as soon as the glass company finds new quarters. The building has 20,000 sq.ft. of floor space and will be used as a combined office and operating warehouse. Present offices of the Homestead Corp. are at 224 Garden St.

ON LEAVE of absence for the past year in performance of a special assignment for one of the country's largest motor freight lines, Tom Collins has rejoined the Cummins Engine Co., of Columbus, Ind., manufacturers of Cummins diesels, in his former capacity of manager of the company's Pacific southern region. Collins will make his headquarters at the new regional offices at 411 W. Fifth St., Los Angeles, Calif.

Collins is a veteran member of the Cummins sales organization. He first became connected with the company several years ago as a sales representative of the Cummins dealer in Seattle, Wash. He later managed the central region at Cleveland, Ohio, and from there was transferred to the West Coast as manager of the Pacific southern region, with headquarters then located in Phoenix, Ariz.

E. PERRY HOLDER, president of the Vulcan Iron Works, Wilkes-Barre, Pa., has been elected president of the Wickwire Spencer Steel Co. Mr. Holder succeeds E. C. Bowers, who has been connected with the company since 1911 and has been president since 1926. Mr. Bowers has resigned because of illness but will continue as a member of the board of directors and executive committee and act in an advisory capacity. Carl I. Collins will continue as executive vice president in charge of production.

THE MANAGEMENT and operation of the shipyard of the Toronto Shipbuilding Co., Ltd., Toronto, Ont., has been taken over by the Redfern Construction Co. Ltd., of Toronto, according to an announcement by C. R. Redfern, president



Smith Air Compressors give you plenty of power—60 cu. ft. a min.

Use only 1 gal. of gasoline an hr.

Here's your compressor for a majority of work. It's big enough—powerful enough to "take it" year after year. Yet, it's easy to move from one job to another and inexpensive to operate. Made with FORD MOTORS and standard parts. Automatic unloading and idling; self-starter. Won't you write for complete information?

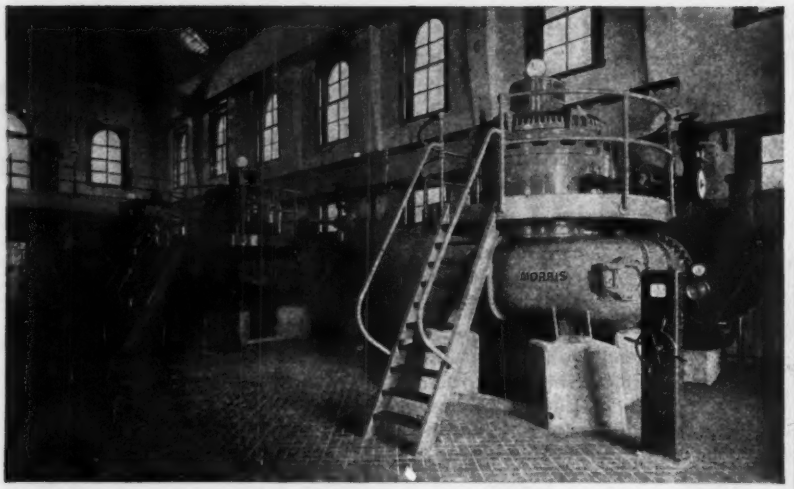
With a Ford Motor and Shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free Booklet

GORDON SMITH & CO.
INCORPORATED
431 College St. Bowling Green, Ky.

SMITH

POWER TO WIN
The Inter-American Highway through Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica is a tribute to engineering achievement.
Delivering materials, grading, constructing bridges and culverts to complete such great construction projects demand dependable power—the type of power Red Seal Engines are contributing to war machines — the power to win.
ARMY E NAVY
Awarded to the Detroit and Muskegon Plants of Continental Motors Corporation for High Achievement.
Continental Motors Corporation
MUSKEGON, MICHIGAN
Your Dollars are Power, too — Buy War Bonds

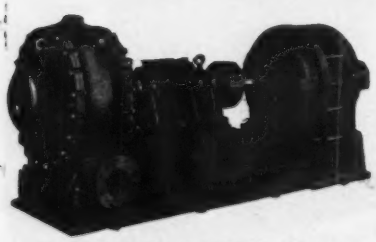


Are your pumps free from

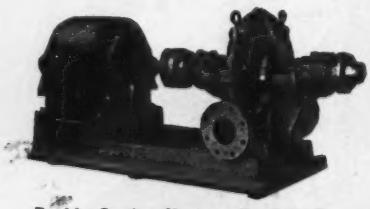
cavitation? confrication? caducity?

CAVITATION . . . eddy currents that reduce hydraulic efficiency; CONFRICATION . . . friction that reduces mechanical efficiency; CADUCITY . . . troubles that accompany old age . . . these weaknesses cause unsatisfactory operation of centrifugal pumps.

You can secure freedom from them by using Morris Pumps, because Morris designs are notable for their high overall efficiency, long life and dependable service. The Morris features that secure and maintain thoroughly satisfactory centrifugal pump operation are described in bulletins which will be sent on request.



Heavy-Duty Material Handling Pump



Double Suction Horizontally Split Pump for Clear Liquids

MORRIS MACHINE WORKS
Baldwinsville, New York

MORRIS
ESTABLISHED 1864

Export Office
50 Church St.
New York 7, N. Y.

CENTRIFUGAL PUMPS

of the construction company. The shi yard is located on Toronto Bay and h been producing small naval vessels an other ships under Canada's wartime shi building program. The yard was origi nally the Dufferin Shipbuilding Co., h it was taken over by the government an its name changed in 1941. Mr. Redfe announced that the new management ha instructed all department heads and fore men to continue in their present capac ties at the plant and that all regular em ployees would continue to work as usua

On July 15 the interest of the J. B Jay Estate in the "Quick-Way" Truc Shovel Co., of Denver, Colo., was pur chased by Luke E. Smith, the survivin partner.

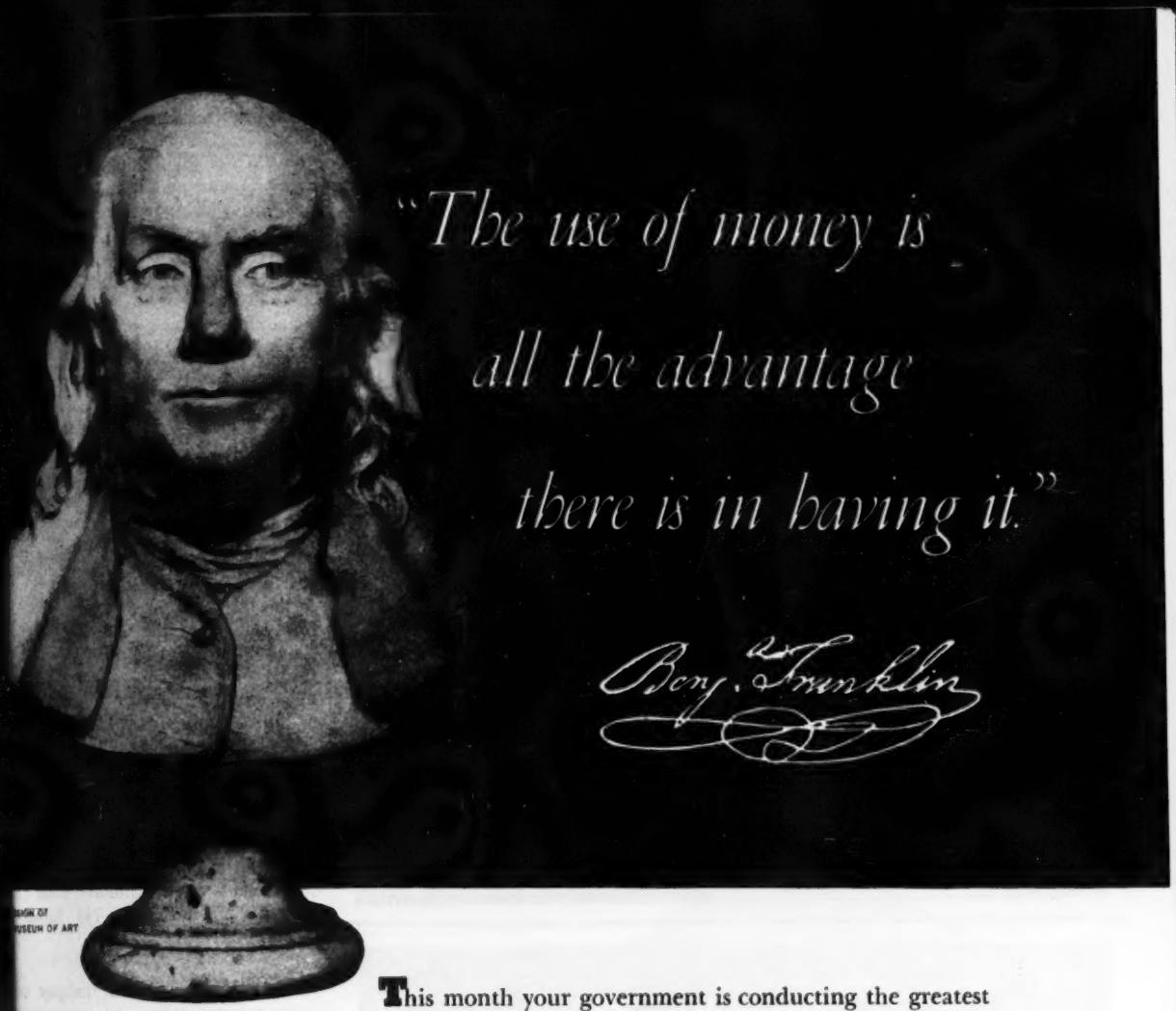
Appointment of W. H. Richardson a general manager of all divisions of th Timken Roller Bearing Co. on the We Coast and in the Orient has been an nounced. He will have charge of mer chandising of bearings for new equip ment, replacement bearings, Timk steel, tubing and rock bits. He will mak his headquarters in San Francisco, Cali

Wickwire Spencer Steel Co. has an nounced the appointment of T. H. Mc Sheehy as sales manager, wire rope division, effective Sept. 1. In his new capacity Mr. McSheehy will supervise wire rope sales throughout the country. J. A. Old, who has been with the company a number of years, succeeds Mr. McSheehy as Pacific Coa sales manager.

Mr. McSheehy first came with Wick wire Spencer in 1923. He has served i a variety of executive sales capacitie with the company. He received a mil tary education and served in the last w through April 1919 as a lieutenant i the United States Navy.

It Has Been Announced that S. Stewart has been appointed assistant sal manager of the hardware products di sion of the Wickwire Spencer Steel C and its subsidiary, the American Wi Fabrics Corp. Mr. Stewart will be locate at the company's home office, 500 Fif Ave., New York, N. Y. He has been w the company since 1923, and until 19 was a sales correspondent in its exp department. Mr. Stewart is especial familiar with the trade in the easte states and in the Chicago area.

Already Flying the "E" of the Arm and Navy and the "Minute Man" of



IGN OF
USEUM OF ART

This month your government is conducting the greatest drive for dollars from individuals in the history of the world—the 3rd WAR LOAN.

This money, to finance the invasion phase of the war, must come in large part from individuals on payrolls. Every man and woman on the Pay Roll Plan will be asked to put an *extra two weeks salary* into War Bonds—over and above his regular allotment. Appoint yourself as one of the salesmen—and see that this sales force has every opportunity to do a real selling job. The sale of these *extra* bonds reduces the inflationary trend and builds added post-war purchasing power.

Financing this war is a tremendous task—but 130,000,000 Americans are going to see it through 100%. You've done your bit—now do your best!

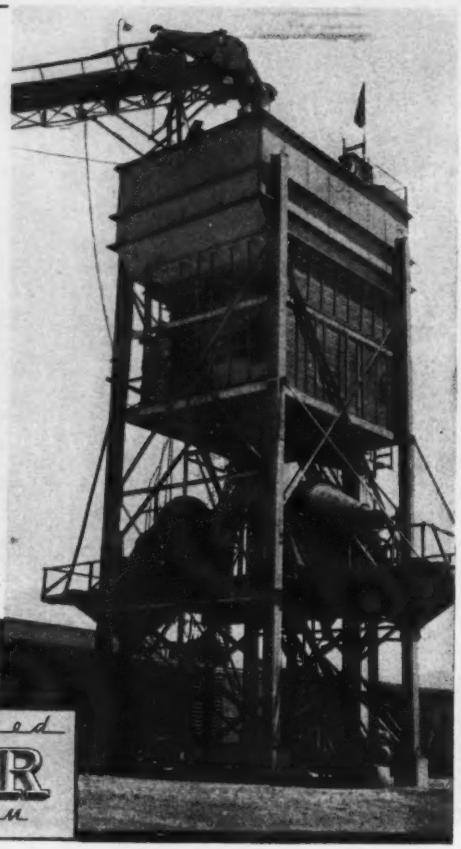
Back the Attack with War Bonds

RAYMOND CONCRETE PILE COMPANY • *Branch Offices in Principal Cities* • **140 Cedar St., New York 6, N.Y.**

A CENTRAL MIXING PLANT
THAT GETS AROUND

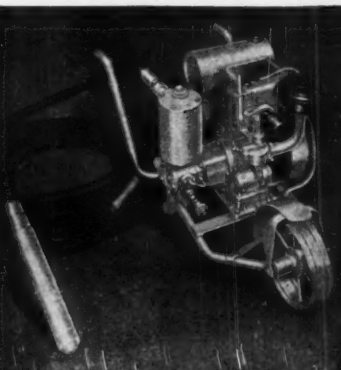
Three huge jobs completed and a fourth begun . . . jobs as widely separated as Indiana, Utah, Texas, and Washington . . . nearly 600,000 cubic yards of concrete poured, and more to come. That's the record of this Butler central mixing plant—versatile, dependable, and efficient.

If you have a concrete job, be sure to call the Butler engineer, for the first step in the most successful jobs is Butler Engineered Design.



BUTLER BIN COMPANY WAUKESHA, WIS.

Engineered BUTLER Design



Alert Contractors!

Buy the

JACKSON

Hydraulic Concrete Vibrator

for Dependable, Speedy Performance

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.

THEY CAN "TAKE IT" 24 HOURS A DAY 7 DAYS A WEEK

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

Treasury Department the Union Metal Mfg. Co., Canton, Ohio, recently hoisted the "M" of the United States Maritime Commission, thereby attaining a distinction enjoyed by few industrial concerns in the country. This company is the first in the Canton area to receive the "M" highest award of the U. S. Maritime Commission for outstanding production achievement, and one of ten industrial concerns in Ohio thus honored up to that time.

WITH A SHEET of steel instead of the conventional paper or parchment scroll, Roger Spink used an electric arc as a pen and molten weld metal as the ink to add his name to the list of 20 fellow welders of the Lincoln Electric Co., Cleveland, Ohio, who are now in military service. This unique, indestructible tablet forms an appropriate tribute to the welders, many of whom are now firing bullets instead of welding beads to beat the Axis.

THE SALES, estimating and advertising departments of the Buffalo Tank Corp. on Aug. 27 moved to 744 Broad St., Newark 2, N. J.

K. R. BEARDSLEE, for the past seven years general sales manager for Carboloy Co., Detroit, Mich., has been named vice president in charge of sales. He has been associated with the Carboloy Co. for the past 13 years, first in the Newark, N. J., branch office and later as district manager at Pittsburgh, Pa.

THE PAST THREE YEARS represent the greatest industrial chimney-building era in the country's history, S. M. Rust, Jr., vice president of the Rust Engineering Co., Pittsburgh, Pa., said recently. It is estimated that more than 2,000 chimneys were erected in that time. The chimneys built in the South amount to almost 50 percent of the total. However, the North has led in the average size of chimneys and consequently in dollar volume.

C. N. GUERASIMOFF, formerly assistant chief engineer, has been appointed chief engineer of the engine division of the Buda Co., Harvey, Ill. Mr. Guerasimoff

FUTURE HIGHWAYS TAKE SHAPE-NOW!

"Superhighways" — high speed transcontinental roads with grade separations and underpasses are post-war necessities. Their need is dictated by the requirements of millions of civilian automobiles returning to unrestricted use, growing truck shipments, bus travel and in emergencies to facilitate high speed movements of military units.

Engineers and contractors faced with this tremendous task already have many of their plans on the drafting board. Safety requirements have led many to specify *Keystone Mastic Board Center Strip* for both longitudinal and transverse joints. The special tongue and groove joint allows for normal expansion and contraction, preventing buckling and "blow-ups". Made from ageless asphalt and mineral fillers, this joint is rigid, waterproof and flexible.

You, too, may find it to your advantage to discuss your paving plans with our engineers and technicians.

• *To help you in your plans, write for Keystone's Paving Products Catalog containing complete specifications. Sample joints are available on request.*

Keystone
ASPHALT PRODUCTS CO.

A DIVISION OF THE AMERICAN-MARIETTA COMPANY

GENERAL OFFICES • 43 EAST OHIO STREET • CHICAGO

The A-B-C's of Wartime Construction

AVOID CONSTRUCTION DELAYS

BUILD SOUND STRUCTURES

CONSERVE CRITICAL MATERIALS

Use readily available, time-proved **LEAD!**

For plumbing and water distribution, for roofing, flashing, gravel stops and various waterproofing, for corrosion-resistant equipment — for all essential construction purposes LEAD is promptly available and unrestricted by WPB orders. It can speed up construction for you since it is stocked by dealers and manufacturers in all parts of the country and you need cut through no complicated red tape to get it.

The excellent performance of LEAD for these purposes is well recognized and time-proved. LEAD can help you make war time construction *good* construction.

LEAD is classed by WPB as least critical of common construction metals. When you use it, you save more critical materials for essential war work and you in no way interfere with war production because there is enough lead for all essential purposes.

You can use LEAD to build faster and better with the least amount of critical material. We will be glad to add your name to the mailing list if you do not receive our free magazine LEAD. It will keep you informed of latest developments in LEAD and Government orders affecting its use.

LEAD IS NOT RESTRICTED FOR THESE APPLICATIONS!

Soil, waste, vent, water service and chemical pipes.
Traps, bends, floor flanges and other fittings.
Roofing, flashing, gravel stops, waterproofing.
Came or glazier's lead.
Chemical equipment.
Calking lead and lead wool.
Other essential uses.

LEAD

INDUSTRIES ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

YOU'RE MONEY AHEAD WHEN YOU SPECIFY LEAD

has been with the Buda Company for the past nine years, during which time he has served as mathematician, engineer on stress analysis and design engineer on gasoline and diesel engines. Mr. Gure-asimoff served in World War I as a Russian officer in charge of a machine gun company and was with the Russian expeditionary forces in Macedonia. After coming to this country he was graduated from Stevens Institute of Technology, Hoboken, N. J.

THE METALLIZING COMPANY of America has announced the purchase of a new building at 135 Cedar St., New York, N. Y., as eastern headquarters for its sales and service operations in that area. The building is a complete operating unit with development and test laboratories, warehouse for metallizing guns, equipment, parts and wire, general service departments, as well as a demonstration shop, complete with equipment included in a typical operating metallizing set-up. V. A. Cook will continue in charge of eastern operations, the general offices of the company being at 1330 West Congress St., Chicago, Ill.

JAMES G. WALKER, prominent in the civil and structural engineering field, has recently been appointed manager of the Transite Asbestos Pipe department for the New York sales district of Johns-Manville.

A native of Lowell, Mass., Mr. Walker's technical training includes two years at Holy Cross University, and four years at the Massachusetts Institute of Technology. After being graduated from the latter institution, he served as engineer for several large construction companies and for the Portland Cement Association.

AN ESTIMATED 40,000 men and women in industry have been trained in the fundamentals of proper design, grinding, brazing, and application of carbide tools during the past five months through the use of silent slide training films, according to reports from the Carboloy Company, Inc., Detroit, Mich. The estimate is based on reports from 43 percent of the industrial plants which had secured 1716 training films from Carboloy. These reports show a total of well over 17,000 trainees during the first five months of the films' availability.

APPOINTMENT of George M. Muschamp and Paul L. Goldstrohm as vice-presidents of the Brown Instrument Co., a subsidiary of Minneapolis-Honeywell Regulator Co., was announced recently.

and the services that go with them

TECO Design Service

Teco has available for distribution to architects and engineers complete data on all phases of timber design, including tables and charts on timber beams, columns, floors, connector loads, bolt loads, stresses, etc.

TECO Consulting Service

Teco maintains a staff of engineers to consult with architects and engineers on their design problems. Teco Connector distributors and fabricators in all parts of the country also render helpful services to architects and engineers.

TECO Typical Design Service

"Typical Designs of Timber Structures"—a 100 page book—is available to architects and engineers free upon request. Copies of several hundred other designs of typical Teco Timber Structures are also available on request.

TECO Research Service

Teco conducts a continuous research program as well as sponsoring research at outstanding engineering colleges and laboratories to increase the design knowledge of timber designers. The benefits and results of this research are passed on to interested individuals in the form of design data and improved products.

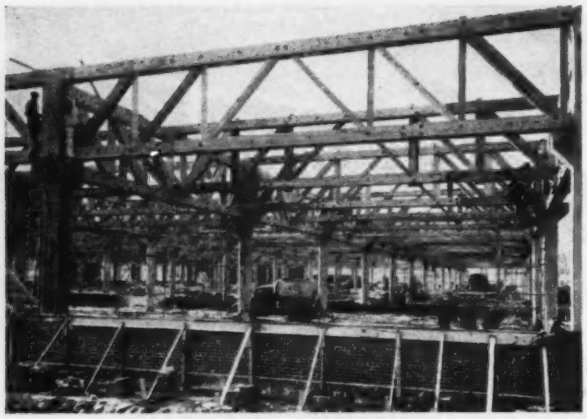
Specifications: Specify Teco Connectors and grooving tools by name. They are endorsed by leading lumber manufacturers and fabricators.

TIMBER ENGINEERING CO.

National Manufacturers of ***TECO*** *Timber Connectors and Tools*

WASHINGTON CHICAGO PORTLAND MINNEAPOLIS

Specify Them!



Rapid erection of war plants is demonstrating advantages of heavy timber construction.

BRIGHT FUTURE FOR TIMBERED CONSTRUCTION

WOOD was the principal heavy structural material when industry built its mills and factories after the Civil War.

Then steel "grew up", developed its structural shapes and riveted joints, providing adequate safety factors with less bulk than timber, so that the use of timber declined.

Prompted by this ascendency of structural steel, timber research attacked the problem of reducing bulk, eliminating excess size, improving drying methods, simplifying joints and fastenings at no sacrifice of safety.

Results were effective and impressive . . . in reducing bulk and adding strength by lamination in place of solid timbers; in perfecting truss and arch designs; in lighter weight through improved seasoning; in fabricating to specifications at the mill; in better preservative treatments; in simplified joints and bearings using shear plates, grids or ring connectors with bolts to afford maximum stiffness and load-bearing strength.

With these improvements demonstrated in 20,000 or more recent structures, came World War II, today's dearth of structural steel, and the necessary switch to timber construction. *Significantly, builders immediately found it totally adequate, more economical, easier to erect . . . factors comprising sound reasons for its steadily expanding use when peacetime construction returns.*

As large suppliers of lumber and timbers on both civilian and wartime projects, manufacturers of Arkansas Soft Pine are prepared to furnish builders with technical data, specifications, etc., and will gladly do so on request. Just address:

ARKANSAS SOFT PINE BUREAU

968 BOYLE BUILDING, LITTLE ROCK, ARKANSAS

Muschamp will be in charge of engineering and Goldstrohm of production. Both posts are newly created. Muschamp, who is 34 years old, has been with the Brown engineering department for 12 years and has been in charge of engineering for the past three years. Goldstrohm celebrated his 20th year with the company recently. He has been serving for the past two years as assistant general manager.

THE PURCHASE of Quimby Pump Co., with plants at Newark and New Brunswick, N. J., by H. K. Porter Co., Inc., Pittsburgh, Pa., has been announced by T. M. Evans, president of the Pittsburgh firm. The Quimby Co. manufactures pumps, including screw, centrifugal and rotex types used in industry. The Quimby plants will be operated as a division of H. K. Porter Co., Inc., a manufacturer of industrial locomotives and chemical processing equipment.

D. J. ATWELL who for the past four years has been serving the Pittsburgh Equitable Meter Co. and its national meter division as New England representative, has been transferred to the Brooklyn, N. Y., district office under the supervision of J. W. Fleet, district manager. Mr. Atwell will handle water meter sales and service in lower New York State, Long Island and New Jersey.

RUDOLPH EBERSTADT, chairman of the board of directors of the Barium Stainless Steel Corp., Canton, Ohio, for the last year and a half, has been elected president to succeed Samuel F. Baker, who resigned. The directors have named J. A. Sisto of New York as new board chairman.

ONE OF THE LARGEST world maps on public display, showing the 65 points on the globe where the American armed forces are stationed, forms the background of an unusual display of pneumatic tools made by the Chicago Pneumatic Tool Co. A big illuminated Victory "V" serves as a display base permitting over 10,000 persons daily to see the pneumatic tools used to make airplanes, tanks, ships, guns, etc. This is the sixth in a series of patriotic window exhibitions by the Chicago Pneumatic Tool Co. at its executive offices, 60 East 44th St., New York, N. Y.

THE FORT PITT BRIDGE WORKS has announced the opening of a Philadelphia office in the Commercial Trust Bldg., Philadelphia, Pa.

DONORA STEEL & WIRE WORKS, Donora, Pa., will spend more than $38,000,000 in modernizing. It will relocate its waterfront to increase the land area. The project will enable the company to em-

BUILDING NESTS FOR EAGLES

In the many battles of this war, one salient fact has emerged. The army having command of the air usually wins the battle.

On the ground, too, command of the air is important! Air for the drills and air tools that are helping to build the airports mushrooming all over the world must be perfectly controlled —ready to serve wherever and whenever it is needed. That calls for compressors that must be able to operate dependably, day after day.

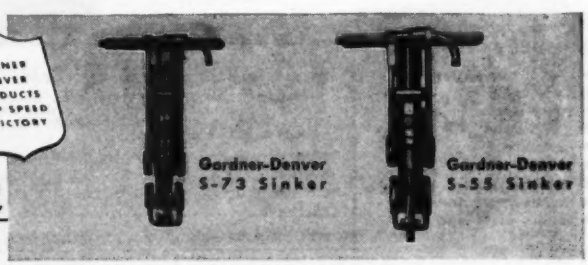
Gardner-Denver equipment fits that description. Gardner-Denver water-cooled compressors are supplying compressed air for drills and air tools dependably—without costly and time-wasting interruptions. They require no special attention —no pampering. Regardless of weather conditions—heat or cold—altitude extremes—they continue to deliver full capacity.

Gardner-Denver Sinking Drills are equally reliable. They are noted for their high footage and their exceptional hole-cleaning ability. They are easy riding and air requirements are low.

For further information on these rugged, dependable aids to better, faster construction, write for descriptive bulletins. Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

Since 1859



SPARLING

MAIN LINE

WATER METERS

The Call for Compounds Grows!

The 1-10 normal flow-range in standard Sparling Main-Line Water Meters increases up to 1-125 in Sparling Compounds. This is worth considering when you are drawing up your plans.

NO SHARP CUTOVER POINT

LOWEST PRESSURE LOSS

Bulletin No. 308 will be sent upon request

SPARLING

LOS ANGELES 54—Box 3277 Terminal Annex
CHICAGO 16—3104 South Michigan Ave.
622 Broadway ..... CINCINNATI 2
101 Park Avenue ..... NEW YORK 17
BOSTON 8 ..... 6 Beacon Street

How to design and erect

- foundations
- abutments
- footings

Where else can you get so many practical aids toward cutting time and costs in this specialized branch of structural engineering?

HERE is a well-known Hool and Kinne book, a favorite for years, now revised to bring you latest practice—standards, working data, facts on new equipment and materials, effective methods that are being used on today's important structural jobs.

Just Published — Revised, up-to-date 2nd Edition

FOUNDATIONS, ABUTMENTS and FOOTINGS

By Hool and Kinne

Revised by R. R. Zipprodt and E. J. Kilcawley

417 pages, 6x9
178 illustrations
$4.00

THE work of 22 specialists, this book covers fully the engineering of foundations of all types. It's all here. From tests to determine soil conditions, through every type of excavation and excavation tool, cofferdams, caissons, piles, bridge piers and abutments—the types and suitability for various purposes, factors of design, design methods, construction pointers, etc.—to legal provisions governing foundations and footings . . . in the clear, complete, and usable style that has made this book so popular among engineers and construction men.

examine a copy

Answers hundreds of questions on:

- **soil investigation**
- **excavating**
- **foundations**
- **cofferdams**
- **caissons**
- **piling**
- **footings**
- **machinery foundations**
- **bridge piers and abutments**

McGRAW-HILL BOOK CO., INC.
330 W. 42nd St., New York 18, N. Y.

Send me Hool and Kinne—Foundations, Abutments and Footings for 10 days' examination on approval. In 10 days I will send $4.00 plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittances.)

Name .....
Address .....
City and State .....
Position .....
Company NR-9-23-43

ploy 3,000 more men and increase shipments of wire products to the South.

JOHN T. PROUT, in charge of plant protection for the Dowty Equipment Corp., Long Island City, and Sunnyside, N. Y., has been appointed director of personnel.

THE NAVY BOARD OF PRODUCTION AWARDS has granted the De Laval Steam Turbine Co., Trenton, N. J., builders of gears and turbines for marine propulsion, centrifugal pumps, rotary oil pumps and centrifugal compressors a second renewal of the right to display the Navy's "E" flag with two white stars as symbols of excellent production.

THOMAS F. TROXELL has resigned as treasurer of the Copperweld Steel Co., Warren, Ohio, but will continue as a member of the board of directors. Millard F. Ronzone, comptroller of the company's steel division and former assistant treasurer of the North American Securities Co., has been elected to succeed Troxell.

UNITED STATES PIPE & FOUNDRY CO., Burlington, N. J., has been awarded the Army-Navy "E". This company has furnished large quantities of cast iron pressure pipe, fittings and special castings from its various plants for water, gas and sewerage service for camps, air bases, naval stations, ordnance works, and industrial plants closely connected with the war effort.

M. C. HORINE, sales promotion manager of Mack Trucks, Inc., has been appointed special consultant to the director, automotive division, War Production Board. Mr. Horine has been granted a leave of absence from Mack and will make his headquarters in Washington.

J. F. KOELLISCH, former advertising agency account executive and trade journal editor, has been named advertising and sales promotion manager of L. Sonneborn Sons, Inc., New York, oil refiners and manufacturing chemists.

P. E. LETSINGER, vice president in charge of distribution, has announced the removal of the central region offices of the Cummins Engine Co., Columbus, Ind., to 8 So. Michigan Ave., Chicago, Ill. L. W. Beck is central region manager and Dominic DeMarco is central region service representative. The offices serve the territory consisting of the states of North Dakota, Minnesota, Wisconsin, Illinois, Missouri and Iowa, also most of South Dakota, Nebraska and Kansas, and northern Michigan and northwestern Indiana.

VETERAN ROLAGRIP PIPE COUPLING

Honorably Discharged from Grueling Mine Duty!

KEYSTONE COPPER COMPANY

MAIN OFFICE
410 Thorne Avenue
P. O. Box 886
Fresno, California

Petroleum Equipment Company,
17th and Connecticut Streets,
San Francisco, California.
Gentlemen:

You may be interested in a little history of the use of the rolagrip couplings which were explained and sold to us by your Mr. Frank Merkel way back in 1941. We were facing the unwatering of an old mine shaft (vertical), and we planned a two stage pumping job - pump first down to the 525 foot level, and install the 40 H.P. 2 stage centrifugal pump, with which we would unwater, on this level. Then go on down to the bottom level, the 675, with a smaller pump, pumping up into the 525 foot level sump.

This was an economy job. New pumps, but everything else had to spell economy. We found a bunch of used, but good, boiler tubing 3¼" O.D. We planned on welding on 3" butt end threads for the screw joints, and using it for discharge pipe. But, with good fortune we had a rolagrip coupling described to us by Mr. Merkel. We ordered 3 or 4 dozen and started pumping from the surface. We placed a small hand winch directly over the shaft opening, with the cable gripping the pipe near the bottom. We let the pipe down as the water lowered, and kept putting on the rolagrips at the surface with each new length of pipe. Of course, we expected to clamp the pipe to the shaft timbers after two or three lengths had been lowered, but after a while, we found that we could grip the pipe string in the middle, with many lengths hanging loose and held together only by the rolagrips. The lengths above the cable hitch would bow in an arc across the shaft compartment, but as nothing happened, we kept on going. We had as much as 200 feet of pipe hanging below the cable hitch, through which water was being pumped - and it throbbed and jerked, but the rolagrips held tight. After we got down, the same pipe line, with which we unwatered, was stapled to the shaft timbers, and is still being used, with many of the original rolagrips holding it together. When the acid water would eat through a thin or weak place in the pipe, it was always such an easy job to make a change without looking up and down the shaft for the "conventional" union. The boys measured the length of the pipe, got another just that length, brought it down, unfastened the rolagrips and slipped it in.

I am sending you one of the rolagrip couplings which was subjected to a rather unusual experience. The acid water in the shaft runs down the sides of the shaft and down the pipe and every place. It eats iron. It does it most effectively when the water is broken up into splashes and combines with oxygen. The water running down the pipe on the rolagrip I am sending you, did its deadly work on the bolts where it riffled and splashed, and you will see that this portion is practically eaten away. The rolagrip did not give up its seal tight grip on the pipe joint until the bolt at one end had been entirely eaten away. Then it eased it, and a leak was discovered. As you see, the whole coupling is much eaten. But, inside, the grips and the rubber gasket were still doing their work. The gasket was put into another coupling.

Yours very truly,
Keystone Copper Co.

H. E. Bush
Superintendent.

ROLAGRIP
PIPE COUPLINGS

Full information regarding G-B Rolagrip Couplings for plain end pipe is bound to stand every superintendent and engineer in good stead at some time or other. Shall we send it to you NOW?

GUSTIN-BACON MANUFACTURING COMPANY
KANSAS CITY 7, MISSOURI
New York Philadelphia Chicago Tulsa Houston San Francisco

G-B MFG. CO.

Send full information on Rolagrip Pipe Couplings for plain end pipe.

FIRM NAME_____

ADDRESS_____

CITY_____ STATE_____

HAVE WATER WHERE YOU NEED IT

With the MUELLER Sprinkling and Flushing Hydrant you can have water connections anywhere you need them. No long trips to the nearest outlet. No necessity for reels of hose to reach areas requiring water. . . With this MUELLER hydrant the lid is flush with the ground. Can be installed in sidewalks, loading platforms, floors, warehouses, construction jobs, golf courses, airports, and parks—right where it is wanted. There never is any obstruction to trip pedestrians, impede vehicles, or damage lawnmowers.

The MUELLER flushing hydrant is well made throughout. The compression stop and drain is high quality red brass. The curb box is so designed as to catch all dripping and waste water, thus eliminating the puddle nuisance common to ordinary hydrants. Will not freeze up. For warm climates not subject to frost we make a tropical model that is built without the stop and drain feature.

Here is a neat concealed hose connection that does not take valuable space, eliminates the need for the more expensive above-the-ground hydrants or the unsightly goosenecks frequently used to fill street sprinklers. Does away with the practice of using regular fire hydrants for filling sprinklers or for construction work. . . Specify plenty of MUELLER Sprinkling and Flushing Hydrants. Have water where you need it.

H-10400

MUELLER CO. ★ DECATUR, ILL.

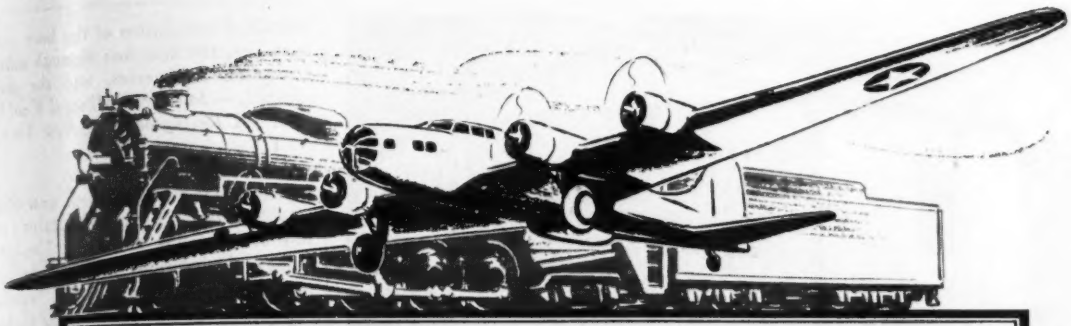
Your Government Needs Money. Keep on Buying War Bonds!

Expansion anchoring — A new 20-page catalog presents helpful data for users of all types of expansion anchoring devices. This handy guide is completely illustrated with full installation instructions. Items covered by the new catalog include expansion bolts, expansion nuts, anchoring units, toggle bolts, lead wood-screw shields, lag screw shields, single and double machine bolt shields, hook bolts and drilling devices. — *Chicago Expansion Bolt Co., 2240 West Ogden Ave., Chicago, 12, Ill.*

A safety method — This manufacturer has just published a booklet for distribution to its construction superintendents, foremen, safety engineers, and other key men. It is entitled "The Austin Safety Method." Its primary purpose is to familiarize all workers with the various aspects of the company's safety program and by so doing, to encourage increased attention to all matters affecting safety. — *The Austin Co., Cleveland, Ohio.*

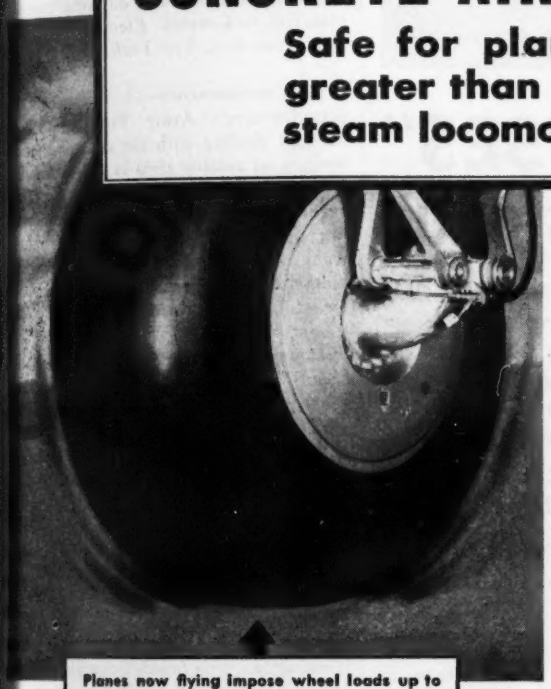
Military construction — A 12-page folder entitled "What to Do When Your Men, Material and Machines Have Gone to War" discusses military, construction and industrial phases and is fully illustrated with late pictures of machinery at work under combat conditions. The pamphlet describes best methods for pusher, straddle and downhill loading, side by side and slot dozing, V-pitch cutting, bank sloping and loading of rooted material. Emergency repairs for parts are also thoroughly discussed and illustrated. — *R. G. LeTourneau, Inc., Peoria, Ill.*

Heat and Power Conservation — Issued as a service to American industry, this Industrial Heat and Power Conservation Manual provides simplified, practical methods for stretching fuel supplies. Such questions are answered as the following: How to find heat and fuel losses; how to figure what can be saved; how long it will take to cover the cost of insulating in fuel savings. The gist of the method is a heat loss estimate sheet which can be removed from the book for survey use in a plant. The face of the sheet carries space for listing the uninsulated surfaces discovered in the heat loss survey and the remaining columns provide space for a

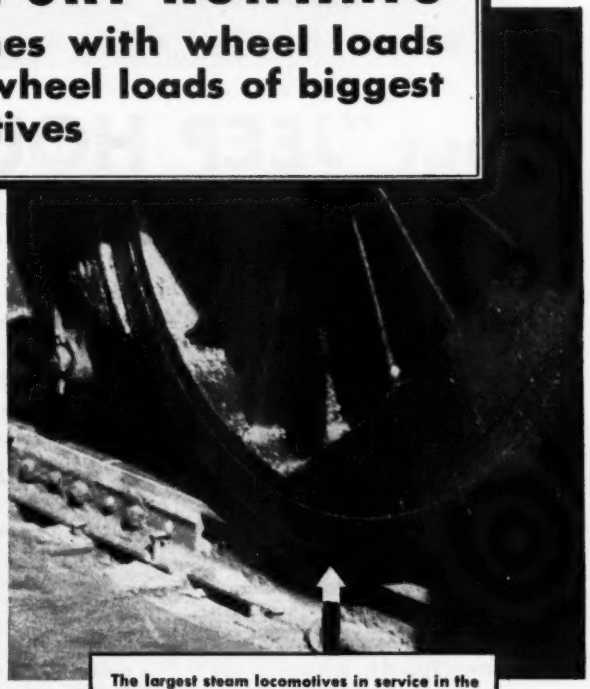


CONCRETE AIRPORT RUNWAYS

Safe for planes with wheel loads greater than wheel loads of biggest steam locomotives



Planes now flying impose wheel loads up to 80,000 lb. It is reported that even heavier planes are being designed. *(Douglas Aircraft Photo)*



The largest steam locomotives in service in the United States have wheel loads of not more than 37,500 lbs.

Heavy wheel loads test the stamina of airport runways or railway roadbeds. And the wheel load imposed by the large modern bombers and transports is even greater than the wheel load of the largest steam locomotives.

For heavy duty airport runways whose use is expected to extend into the postwar period, safety, economic and engineering facts point to concrete.

The first cost of adequately designed concrete runways for heavy duty wartime or peacetime service is usually less than that of any other pavement of equal load-carrying capacity.

Engineering design data for wheel loads up to and beyond 150,000 lb. show how to build concrete runways of unquestioned stamina without wasteful overdesign or danger of early failure under heavy traffic.

Our experienced engineers are ready to assist in the design of concrete war or postwar airport pavements.

PORTLAND CEMENT ASSOCIATION
Dept. A9d-17, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Buy more war bonds

Stout "JEEP HOUSES" of WOOD and LAUCKS GLUE

FAST HOUSING? This is it—8 men to a unit—125 units a day. It's the new war-born "Jeep House," prefabricated by Stout Houses, Inc., of Detroit, Michigan.

From the tropics to the Arctic these sturdy shelters give our fighting men protection and comfort. Each "Jeep House" is 15′ x 15′. Framework and structural members are of wood, and walls of insulation board are glued to the framework with Laucks Construction Glues. Houses are shipped in sections, ready for erection.

Laucks specially formulated Construction Glues have helped create many new building techniques—as they solved wartime problems and shortages. *Let them help you!* For complete information, write or wire:

I. F. LAUCKS, Inc.

Lauxite Resins—Lauxein Glues

CHICAGO, 2—6 North Michigan Avenue
LOS ANGELES, 1—859 E. 60th Street
SEATTLE, 4—911 Western Avenue
Factories:
Seattle, Los Angeles, Portsmouth, Va., Lockport, N. Y.
In Canada:
I. F. LAUCKS, Ltd., Granville Island, Vancouver, B. C.
HERCULES-LAUX-MERRITT, Ltd., Stanbridge, Quebec

● Don't forget, LAUX REZ, the pioneer resin sealer and primer, protects wood as rust-proofing protects metal.

LAUCKS CONSTRUCTION GLUES
Consult LAUCKS—America's Glue Headquarters

simplified calculation of the bare surface heat loss, the heat loss through different insulation thicknesses, and the savings effected. — *Industrial Mineral Wool Institute, 441 Lexington Ave., New York, 17, N. Y.*

Insulating Materials — A new 60-page catalog covering the manufacturer's entire line of insulating materials. The catalog lists and describes hundreds of items including varnished cloths, varnished tapes, cords, cotton sleeving, varnished tubings, mica, wedges, soldering materials, cements and compounds. Tab sheets separate the catalog sections, each of which is devoted to a different type of material. — *General Electric Co., 570 Lexington Ave., New York, N. Y.*

Tire maintenance—A section of the manufacturer's Army Training School Manual dealing with the care and maintenance of combat tires is now available. It contains information on the proper care, preventive maintenance and servicing of tires, tubes, endless and block tracks and other rubber products used on motorized equipment. — *The B. F. Goodrich Co., Akron, Ohio.*

Inspection Car — A new bulletin tells about the new model two- to four-man inspection car known as the Roadmaster, which is said to embody the latest engineering refinements in safety and comfort, together with long life construction and economical power. It is a larger car of heavy duty design equipped with special spring-mounted pedestal bearings and deep, well cuchioned seats that absorb all road shock. — *The Buda Co., Harvey, Ill.*

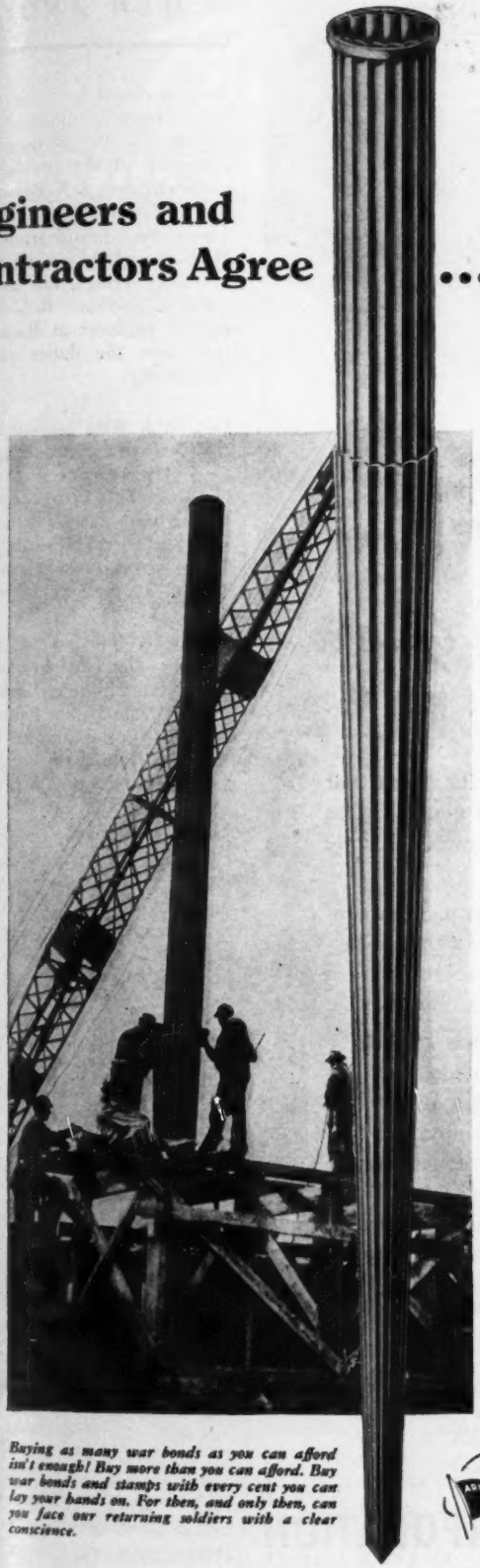
Air Motored Agitators — In addition to illustrations, this booklet contains a catalog of agitators operated by compressed air. Two special features emphasized are elimination of fire and explosion hazards on mixing operations and the variable speeds obtained through air control.— *Eclipse Air Brush Co., Inc., 390 Park Ave., Newark, N. J.*

MITCO
OPEN STEEL FLOORING
Pressure Formed
90% Open Area
Easy to Install
Hendrick Manufacturing Company
Box 48 Dunmore Street, Carbondale, Pa.

BELMONT IRON WORKS
PHILADELPHIA BOYERSFORD EDDYSTONE
Fabricators *Contractors*
Exporters
STRUCTURAL STEEL
BUILDING & BRIDGES
RIVETED—ARC WELDED
BELMONT INTERLOCKING
CHANNEL FLOOR
Main Office Philadelphia, Pa.
44 Whitehall St. New York Office

Fast, Dependable
SHOVELS, CRANES
DRAGLINES, BACK HOES
Crawler or Truck—Gas or Diesel
10 Models of 3/4-5/8-1/2-3/8 cu. yd.
THE **BYERS** MACHINE COMPANY
RAVENNA, OHIO
DISTRIBUTORS THROUGHOUT THE WORLD

Engineers and Contractors Agree ....MONOTUBES' *Speedy Extension* CUTS TIME and COSTS



ONE of the features of Union Metal's all-steel *tapered* Monotubes which foundation engineers and contractors like best is their speedy and easy extension. Extendible Monotubes permit the installation of varying pile lengths without delay or waste—even in low headroom.

Other outstanding Monotube features are:

SPEEDY DRIVING—Monotubes are so strong and rigid they require no heavy core or mandrel and can be driven with average job equipment.

SPEEDY HANDLING—Monotube steel casings are light in weight, can be handled quickly and economically.

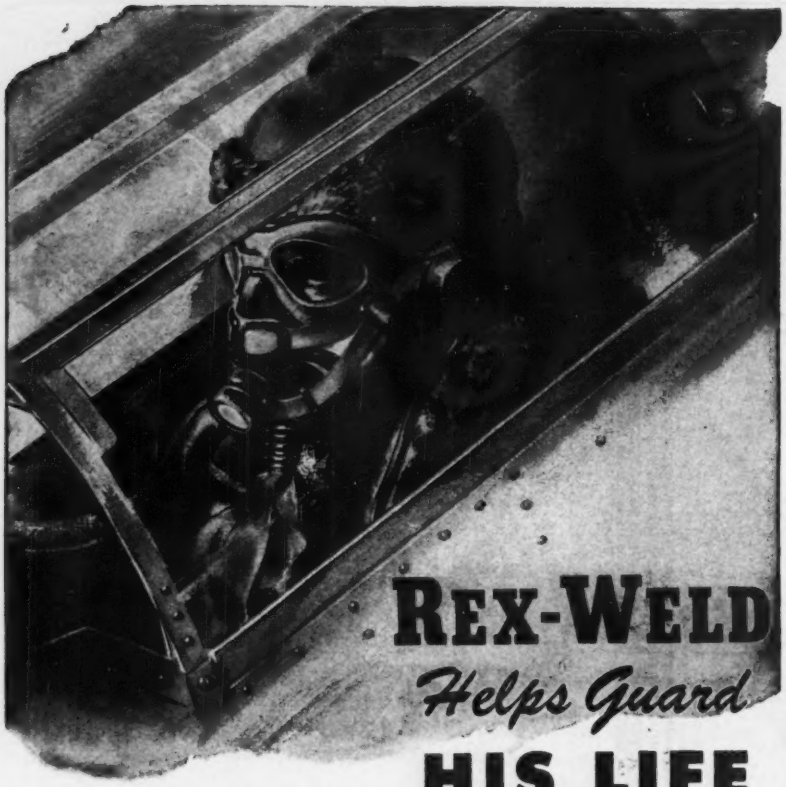
SPEEDY INSPECTION—The hollow tubular design of Monotubes enables you to inspect these casings quickly and thoroughly from top to toe prior to concreting.

Monotubes are available in a wide range of gauges, sizes, and tapers to meet exacting requirements in varying soil conditions.

THE UNION METAL MANUFACTURING COMPANY

Canton, Ohio

Buying as many war bonds as you can afford isn't enough! Buy more than you can afford. Buy war bonds and stamps with every cent you can lay your hands on. For then, and only then, can you face our returning soldiers with a clear conscience.

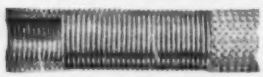


REX-WELD
Helps Guard
HIS LIFE

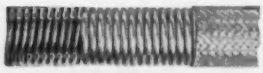
REX-WELD Flexible Metal Hose has met the critical test that demands only the best materials for our combat planes. More and more bombers, fighters and interceptor-pursuit ships are being Rex-Weld equipped.

REX-WELD's war service is not confined to the planes themselves. In the steel mills and munition factories, on the production and assembly lines, everywhere that war-worthy flexible connections are needed, REX-WELD is rendering vital service.

There are specific reasons for this. REX-WELD is a specially constructed flexible metal tubing. It is fabricated from strip metal by a precision autogenous welding process that produces uniform, stronger wall structure plus extreme flexibility. REX-WELD stands up under high pressures, high and low temperatures, extreme contraction and expansion. It is seep-proof to gas, water, oil, air and searching fluids.



Type RW-81
(annular corrugations)



Type RW-91
(helical corrugations)

Available in continuous lengths to 50 ft. Both Steel and Bronze. 3/16" I. D. to 4" I. D. inc. Pressures to 14,500 p.s.i. Temperatures to 1000° F.

Write for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois

MEN AND JOBS

Announcement has been made by J. C. Smith, recently appointed state highway engineer of the Wyoming highway department, of the promotion of maintenance engineer **J. R. Bromley** to the position of construction and maintenance engineer with headquarters at Cheyenne. **H. E. Langheldt,** maintenance engineer at Rock Springs, will assume the same duties at Sheridan. **R. G. Stapp,** former project engineer at Rock Springs, will take over the duties vacated by Mr. Langheldt.

Col. H. J. Wild has retired as executive officer for the Seattle Engineer District, U. S. Army Engineers, to return to civilian life. This is his second retirement in four years, as he retired as U. S. district engineer at Seattle in 1939. Col. Wild was recalled to active duty in April 1941 as a result of the war emergency.

Sidney T. Roebuck, of Newton, Miss., has been elected chairman of the Mississippi State Highway Commission to succeed the late Hiram Patterson. **Munds Bush,** of Hattiesburg, has been appointed highway commissioner by Gov. Paul Johnson succeeding Mr. Patterson.

Sterry J. Mahaffey, of Richmond, Va., civil engineer and manager of Henrico County, Va., on September 1 was appointed city manager of Durham, N. C., to succeed **Henry A. Yancey,** who resigned to become city manager of Greensboro, N. C. Mahaffey will take up his duties at Durham on October 1. For eleven years he had been connected with the Virginia State Department of Highways as bridge and highway engineer and as resident engineer. He then became city manager of Franklin, Va., for three and one-half years before becoming manager of Henrico County on Feb. 1, 1941.

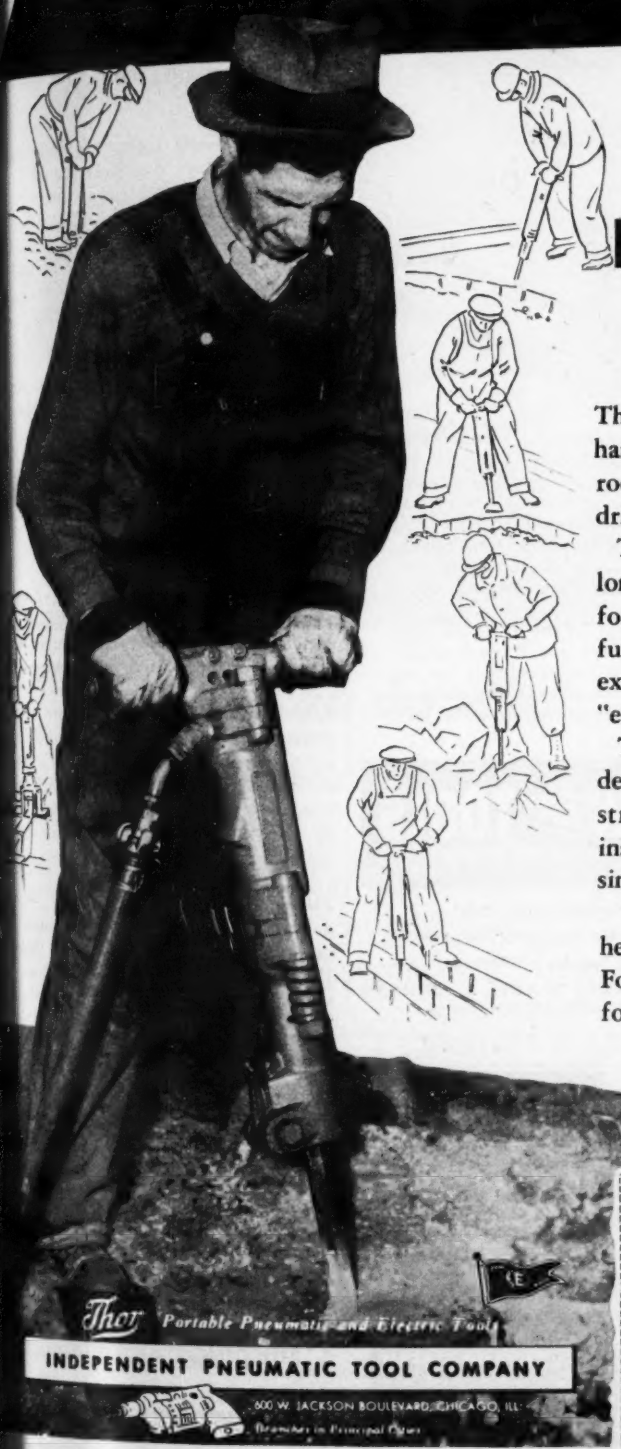
City Council of Gastonia, N. C., has approved a contract with **W. M. Platt,** engineer, of Durham, N. C., to plan and supervise the number of projects planned for postwar construction.

Capt. L. R. Fisher, Charlotte, N. C., Commanding Officer of the North Carolina State Highway Patrol, western section, has been commissioned a captain in the U. S. Army. He will be engaged in highway safety work in the Provost Marshal General's Department in the American military group governing occupied areas.

J. Fred Ripply, Jr., of Chicago, has been appointed secretary of the plan-

Pounding Out

VICTORIES ON THE CONSTRUCTION FRONT!



Thor

PAVING BREAKERS SPEED SCORES OF WARTIME JOBS

Thor's heavy artillery of powerful but easy handling paving breakers speed up demolition, rock breaking, sheeting driving, tamping, spike driving and other vital wartime jobs.

Thor breakers get their *extra power* from *extra*-long piston hammers that greatly increase the foot pound blows . . . cylinders designed to give full effect to every hammer blow . . . and Thor's exclusive short-travel tubular valve that squeezes "every bit of power from every foot of air."

Thor breakers get their *handling ease* from design that's compact, perfectly balanced, and stripped-for-action . . . from c-o-o-l, rubber-insulated grip handles . . . and from the quick, simple action of Thor's latch type retainer.

There are Thor breakers for light, medium and heavy duty . . . in weights from 32 to 84 pounds. For detailed information on these breakers, write for Thor Air Tool Catalog 42A.

HELPFUL FACTS

Mail coupon for catalog of Thor Air Tools.

INDEPENDENT PNEUMATIC TOOL CO.
600 W. Jackson Blvd., Chicago 6, Ill.

Please send Thor Catalog 42A.

NAME_____

TITLE_____

COMPANY_____

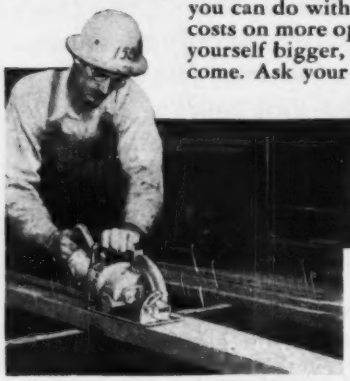
ADDRESS_____

CITY_____ STATE_____

HAVE YOU EVER DONE GROOVING with SKILSAW?

Do you know your regular SKILSAW will do grooving *in a single operation?* Just replace the regular blade with this GROOVING BLADE (illustrated at left) and you're ready at once to groove for stairs, shelves, and weather stripping . . . to slot floors for sliding doors . . . to speed up rabbeting, mortising and many other jobs.

It's wise right now to learn about *all* the different jobs you can do with SKILSAW. That's how you'll learn to cut costs on more operations . . . to save more time . . . to get yourself bigger, more profitable contracts in the days to come. Ask your distributor for a demonstration NOW!



SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

SKILSAW, INC.
4771 Wilnomac Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

With this GROOVING BLADE . . . SKILSAW speeds all grooving, rabbeting, mortising.

and zoning board of the city of Wilmington, N. C. A five-man city planning board has been created. It consists of Mayor Bruce Cameron, City Manager A. C. Nichols, Dr. W. Houston, Henry R. Emory, and W. A. Fonvielle. They will plan the future development of the city.

Robert A. Porter, for many years assistant superintendent of the Mecklenburg County Drainage Commission at Charlotte, N. C., has been appointed superintendent to succeed C. H. Wolfe, who resigned after holding the post 30 years.

Robert C. Boyd, assistant highway engineer at Ottumwa, Ia., has replaced C. L. Gleason as district highway engineer of the first district at Ames. C. L. Gleason has been commissioned an officer in the Seabees and is now receiving his indoctrination. **Don Teal** is replacing R. C. Boyd as assistant highway engineer for the Ottumwa district.

Alexander R. Kingaard is chief mine engineer and manager of the Compania Minera del Gran Oeste at its tungsten mine in Baja California, Mexico. Formerly he was with the McNeil Construction Co. as construction engineer on their basic magnesium project in Las Vegas, Nev.

Will C. Huggins, Milwaukee, Wis., senior engineer in the area engineer's office at Mitchell Field, has been commissioned a major in the United States Army.

Ernest T. Perkins, West Hartford, Conn., assistant engineer in the Bureau of Engineering and Construction of the Connecticut State Highway Department, has taken a military leave of absence and will enter the U. S. Army Transportation Corps with the rank of lieutenant.

James Melton, Weston, Conn., Metropolitan Opera singer and radio star, has been elected chairman of the Merritt Parkway Commission, Connecticut, to succeed John Cavanaugh of Norwalk.

DRILLING CONTRACTORS

CORE BORINGS
DIAMOND & SHOT CORE DRILLING
LOAD TESTS—TEST PITS

THE GILES DRILLING CORPORATION
18 East 48th Street New York, N. Y.

OHIO LOCOMOTIVE CRANES

15 to 50 TONS CAPACITY

DIESEL • ELECTRIC • GASOLINE • STEAM

The OHIO LOCOMOTIVE CRANE CO.
BUCYRUS OHIO

THE MOUNT VERNON BRIDGE CO.

Engineers Contractors
STRUCTURAL STEEL
RAILWAY AND HIGHWAY BRIDGES
BUILDINGS AND VIADUCTS

MOUNT VERNON, OHIO

"It's here to do a job, Pal—and soon!"

e can't get along without plenty hat *friendly* wire rope. What does o? Just stick around, soldier—and w do you think that souped-up nco you're running around in got the boat? Wire Rope!"

The guard is right. It takes a lot of y-handling wire rope to move the f an Army needs. Think of North ica—think of Sicily! And there to be *enough* of it!

That's why you and we at home have to conserve the wire rope use.

But when you do need to order replacements, won't you please accept it *without* reels, if lengths permit, so that handier reels can be spared for the boys out there? Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, N. Y.

• • •

Wickwire Spencer, the first in New England to be awarded the Maritime M and Victory Fleet Flag, has now received the GOLD STAR for maintaining excellence of production.

DO YOUR MEN KNOW PROPER SHEAVE DIAMETERS?

Our FREE book, "Know Your Ropes," will tell them. It tells why a sheave that is too small wears out rope fast. It shows how to figure the right size sheave for every diameter of rope . . . and gives numerous other "Life Savers" that will help make your present wire rope last longer. Send for your free copy, today!

SEND YOUR WIRE ROPE QUESTIONS TO WICKWIRE SPENCER

WICKWIRE ROPE

Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Seattle. Expert Sales Department: New York City

WISSCO PRODUCTS

Says the water dept. supt.

"I want water gates with operating mechanisms I can depend upon, stems that will not fail, seat and disc rings that stay tight, stuffing boxes that can be easily adjusted, and bolts and nuts that will not rust together."

—*and* Kennedy Water Gates

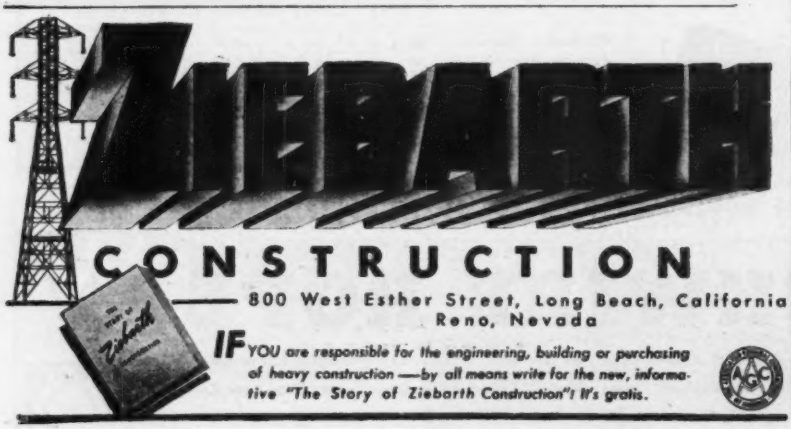
meet every one of these demands

EVERY PART of the Kennedy A. W. W. A. Water Gate is designed and built with one purpose—to assure dependable, trouble-free service. Stems are much stronger than required by standard A. W. W. A. specifications; the operating mechanism combines utmost simplicity, flexibility and positive action; the rings on seats and discs cannot work loose; bodies, bonnets and flanges are heavily proportioned; and all adjustable or renewable parts have special provisions for easy and speedy manipulation. You can always depend on a Kennedy A. W. W. A. Water Gate to close tightly, open easily and operate dependably.

Write for the Kennedy Catalog

The Kennedy Valve Mfg. Co. Elmira, N. Y.

KENNEDY
A.W.W.A. WATER GATE VALVES


ZIEBARTH
CONSTRUCTION
800 West Esther Street, Long Beach, California
Reno, Nevada
IF YOU are responsible for the engineering, building or purchasing of heavy construction —by all means write for the new, informative "The Story of Ziebarth Construction"! It's gratis.

Morton J. Newburger, Westport, was named secretary.

H. N. Morris has received his commission as lieutenant in the construction battalion of the Navy and has started training. Lieutenant Morris resigned as secretary of the Ohio Society of Professional Engineers. He was formerly associated with the engineering department of the Trojan Powder Co. at the Plum Brook Ordnance plant, Sandusky, Ohio.

Lt. Col. John W. Patton has been appointed district engineer at the Charleston office of the U. S. Engineers, succeeding Col. D. W. Griffiths who has been transferred to an Engineer regiment. **Capt. Wm. V. Albright,** formerly chief of operations, Charleston office, has been made executive officer, succeeding Patton.

Manuel F. Schiel, of Houston, Tex., chief engineer of bridge construction for Montgomery County, is now serving with the army in the South Pacific area.

Capt. Noble A. Bosley is the new executive officer of the Seattle Engineer District. He succeeds Col. H. J. Wild. Captain Bosley has been serving as assistant chief of the construction division. As a civilian engineer, Captain Bosley has supervised construction in Montana, in Omaha with the Federal Public Works Administration, with the Seattle Transit System, and with the Phoenix Engineering Corp., on hydroelectric construction.

W. H. Beazley, director of the Texas WPA office of engineering and construction at San Antonio, is now in training with the Seabees at Camp Peary at Magruder near Williamsburg, Va. Mr. Beazley received his engineering education at the Agricultural and Mechanical College of Texas.

Herman Nelson has been appointed county highway engineer for Madison County, Ala. He has been connected with the State Highway Department for about twenty years.

Lt. Col. R. A. Tudor has been named to succeed Col. Donald J. Leehey as district engineer of the Portland, Ore., district, U. S. Engineer Dept.

George H. Hanes, formerly a member of the British Columbia Legislature, has been named city engineer of Prince Rupert, B. C.

George S. Turner has been appointed chief of the field division of the Federal Communications Commission's engineering department.

Raymond L. Pike former director of the

OODALL
UBBER

s on the job when NEW YORK CITY URT HOUSE was lt. View shows foun- ion work progressing.

UCTION HOSE • AIR HOSE • JET HOSE
IR LOCK GASKETS • RUBBER BOOTS

re among the items supplied by ODALL for this important project. n, as now, contractors depended on ODALL quality to help maintain edules during the complete course construction. The name GOODALL contractors hose, belting, boots, cloth- and other rubber products, continues be a guarantee of efficient, reliable vice, no matter how tough the going.

"NEWTYPE" Suction and Discharge Hose.
A husky, two-purpose hose that is light and flexible. "Newtype" construction permits it to be rounded into shape if accidentally crushed. Smooth bore.

"ALL-SYNPLASTIC" Air Hose, Style D-142.
Wrapped duck construction-tough; durable, safe. For all heavy-duty air tool service.

"STYLE D-119" Jet Hose.
A thoroughly safe and reliable hose for high pressure machine jetting at 250 lbs., maximum.

"GOODALL" Rubber Boots.
"Industrial Brand", hip and below-knee styles, plain or "Toe-Saver". "Storm King", above-knee style, plain or "Toe-Saver". Send for new folder, "How to Buy Rationed Rubber Footwear".

WE ARE PARTICIPANTS IN THE OWNERSHIP AND OPERATION OF NATIONAL SYNTHETIC RUBBER CORPORATION

MAIN OFFICE—9 South 36th Street, PHILADELPHIA 4, PA.

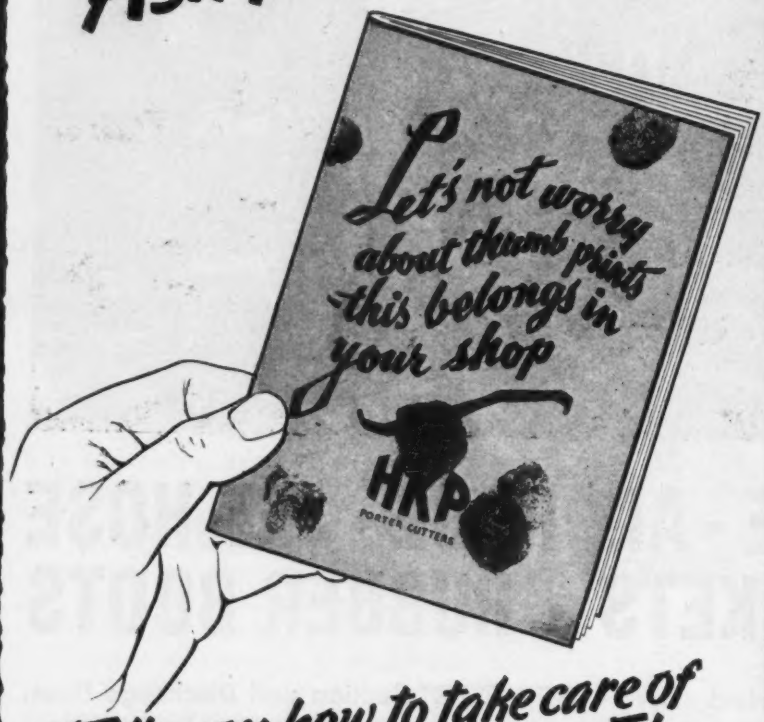
Branches—New York, Boston, Pittsburgh, Chicago. Gov't Dept.—Washington, D. C. West Coast—Goodall Rubber Co. of Calif.—Los Angeles, San Francisco, Seattle, Salt Lake City. Factory—Trenton, N. J. Established 1870. 73 Years of "Know How"—Our Most Valuable Commodity.

GOODALL RUBBER CO. INC. R G Co INC

Buy WAR Bonds—Buy MORE Bonds!

GOODALL
RUBBER COMPANY INCORPORATED

Ask for this book



Tells you how to take care of small tools-Bolt Clippers, Files, Taps, Drills, etc. The boiled down facts to help you get the most out of these tools-use, wear, repair and selection. Handy pocket size. Just ask on a post card for-Porter's Tool Maintenance Book it's FREE

REG. U. S. HKP PAT. OFF.

PORTER CUTTERS

BOLT CLIPPERS — AUTOBODY REPAIR TOOLS — PRUNERS

H. K. PORTER, INC., 403 ASHLAND ST., EVERETT, MASS.

engineering division of the Indiana State WPA, has been appointed director of the new state economic council which was formed by the last legislature to make plans for the post-war period.

Frank O. Lee, director of public works at St. Petersburg, Fla., has resigned to form a partnership with Paul Jorgensen as consulting engineers.

Delos M. Palmer, dean of engineering at the University of Toledo since 1934, has been appointed plant engineer at the American Propeller Corp., subsidiary of the Aviation Corp., Toledo, Ohio, manufacturers of hollow steel propeller blades for combat aircraft.

NEWS OF THE WEEK

(*Continued from p. 73*)

Utah steel mill operated by branch of U. S. Steel

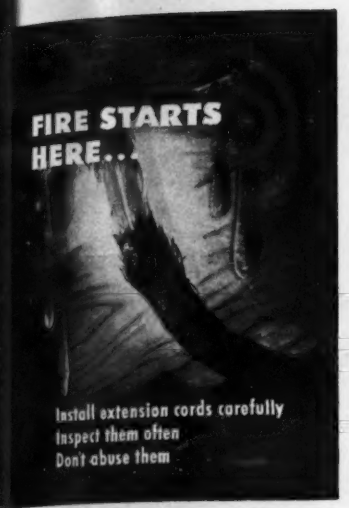
Operation of the $180,000,000 government-owned Defense Plant Corporation steel mill nearing competion at Geneva, Utah, has been contracted for by the Geneva Steel Co., a newly organized subsidiary of U. S. Steel Corp.

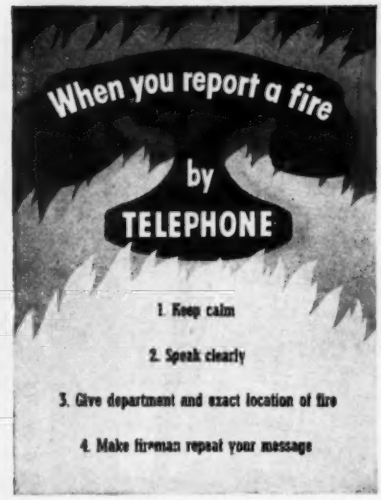
Under the terms of the agreement no operating fee or other compensation is to be paid to Geneva Steel for its services during the wartime operation of this new plant, by far the largest integrated mill west of the Mississippi River and the first completely integrated steel plant constructed in this country during the past 20 years.

Embracing more than 1,600 acres of what was an agricultural district less than two years ago, this huge steel manufacturing plant of modern design, known as Geneva Works, was constructed for the Defense Plant Corp., an R.F.C. subsidiary, primarily to provide steel for wartime shipbuilding needs on the Pacific coast.

Geneva Works was designed by U. S. Steel Corp. engineers and erected by its Pacific Coast subsidary, the Columbia Steel Co. No construction fees were paid to either the designers or constructors other than for their out-of-pocket expenses. Most of the construction work is being performed by sub-contractors numbering more than one hundred.

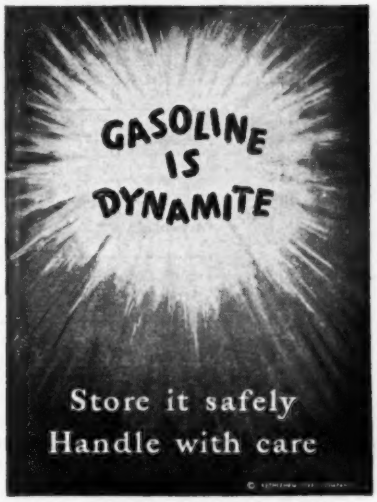
Despite delays in delivery of essential materials caused by limiting priorities and shortage of labor, this new plant embracing raw material facilities, coke ovens, blast furnaces, and steelmaking and finishing equipment, is nearing completion. It will have a rated yearly capacity of 1,200,000 tons of ingot production.





COME ON ED— STOP DAY-DREAMING IN FRONT OF THAT POSTER
HOW TO USE A FIRE EXTINGUISHER
LOOK OUT, ED SHE'S ON FIRE!
THAT DAY-DREAM KIND OF PAID OFF ... HUH, BILL?

fighting fires with



POSTERS

Bethlehem has long had an efficient fire-fighting organization. But war conditions multiply normal fire hazards. Thousands of new employees have come to work. Large additions have been made to existing facilities, and entire new departments set up. At the same time, war needs have intensified the pressure for production.

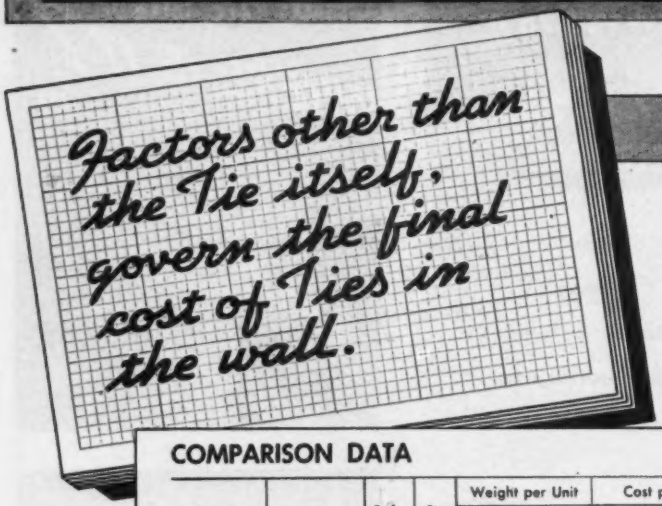
Since the start of the war emergency Bethlehem has redoubled its effort to keep down production loss due to fires. Much new equipment has been provided: extinguishers, alarm boxes, sprinkler systems, hose outlets and fire engines. And as plants grew, fire-fighting personnel was expanded, and given special training.

BETHLEHEM STEEL

A poster campaign, of which a few representative samples are shown on this page, is one important detail of this program. Each poster registers in the employee's mind a single, specific point in fire-fighting or fire-prevention. Prominently displayed in steel plants, shipyards, fabricating shops, these posters are helping to maintain a favorable fire-loss record through the war years.

A fire on the production front can cost American lives on the battle-fronts. Even seemingly trivial fires have a grave cumulative effect. The aim is to prevent fires from occurring at all—and, if they do occur, to make them die young.

FORM-TY ENGINEERING FACTS



COMPARISON DATA

SYSTEM	TIE	Safe Load	Tie Length	Weight per Unit			Cost per Unit		
				Tie Only	Working Parts	Total	Tie Only	Working Parts	Total
Prefabricated	½" Tyscrus	6000#	10"	.34#	2.94#*	3.28#	$.08	$ .31	$ .39
	A.C.Form-Tys	3000#	29¼"	.38#	1.73#¢	2.11#	$.05	$ .18	$ .23
	Snap-Tys	3000#	29¼"	.38#§	1.44#	1.82#	$.05	$ .14	$ .19
Field-Assembled	Band Iron	1500#	36"	.39#	.86#†	1.25#	$.03	$ .20	$ .23
	½" Rod & Clamps	5000#	36"	2.0#	3.62#†	5.62#	$.08	$ .60	$ .68
	¾" Tilt Lock	5000#	10"	.32#	8.5#†	8.22#	$0.325	$1.45	$1.4825

§ Includes built in spreader unit.
¢ Includes Spreader Plates for Form Spreading.
† No provision for spreading forms.
* Includes Tycones for Form Spreading (Opt.)

Weight; the number of ties required; investment and depreciation on working parts; erecting and stripping time; labor required for "on the job" preparation; safety margins which must govern operating schedules—these determine the cost of your concrete form work. With Richmond's Form-Ty Engineering you get specific advantages in every one of the above-mentioned items. The comparison data shown above gives you an idea. For instance, why pay 68c when 38c is enough? Reach for your Architects or Engineering File and get the whole story in Richmond's Form-Ty Engineering Guide. Or, write us for your individual copy. Better still, let us look at your job plans and give you exact figures.

It May Pay You to Tear Out This Ad and Save It!

SEE OUR CATALOG IN SWEET'S

RICHMOND SCREW ANCHOR COMPANY, INC.
515 LIBERTY AVENUE • BROOKLYN, NEW YORK

which can be stepped-up to approximately 1,500,000 tons. Production of steel plates will reach 700,000 tons per year with structural steel amounting to about 250,000 tons.

. . .

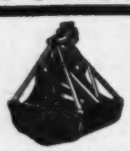
High damages assessed against tank repairers

A verdict of $10,000 punitive damages and $4,000 actual damages was awarded recently to the city of Illmo, Mo., in a suit against Ethel Hester Peitzman and William A. Peitzman, doing business as U. S. Elevated Tank Maintenance Co. The basis of the complaint was that the defendants had irreparably injured the plaintiff's elevated water tank while repairing it.

Witnesses testified at the trial that the defendants had taken over 1,100 rivets out of the tank, which they stated did not leak before being repaired. A witness present when rivets were removed, as well as expert witnesses who had examined some of the rivets after removal, testified that the removal of the rivets was unnecessary in almost all cases. Other testimony indicated that in many cities the company had removed a great many rivets from elevated tank that need not have been removed.

Mr. Peitzman stated that he had operated the Midstate Steeplejack & Construction Co. until the summer of 1938 at which time he had sold most of the property of the company to his wife doing business as U. S. Elevated Tank Maintenance Co. He further states that early in 1942 he commenced doing business as the Dixie Tank and Bridge Co. and that his wife sold the assets of the U. S. Elevated Tank and Bridge Co. and that his wife sold the assets of the U. S. Elevated Tank Maintenance Co. to him at that time. It also appeared from his testimony that his name was changed to William A. Riley in legal proceedings in 1942.

Hayward Buckets



Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.
THE HAYWARD CO., 48-50 Church St., N. Y.

The PHOENIX BRIDGE CO.
BRIDGES and BUILDINGS
General Office and Works
Phoenixville, Pa.
District Offices
New York, N.Y. Boston, Mass.
Washington, D. C.

EPPINGER AND RUSSELL CO.
Wood Preservers Since 1878
All kinds of Structural Timbers and Lumber Pressure Treated with Creosote Oil or
DU PONT CZC Chromated Zinc Chloride
80 EIGHTH AVE., NEW YORK, N. Y.
POLES, CROSS ARMS, PILING, TIES POSTS, BRIDGE AND DOCK TIMBERS
TREATING PLANTS
Jacksonville, Fla. Long Island City, N. Y.

It's Tragic To Let A Motor Truck Work Without A Trailer

Fruehauf Carry-All Trailers, in various designs and with capacities up to 50 tons, are widely used in construction work and for carrying machinery and other heavy loads. Other models are especially adapted for the hauling of sheet and fabricated steel, stone, cement, pipe and other engineering and construction loads.

IT'S wasteful at any time . . but in wartime, when there is a shortage of rubber, steel, gasoline and oil . . *it's tragic to let a motor truck work without a Trailer!*

The war has created shortages of hauling equipment, and of the materials of which the equipment is made. That makes it necessary to conserve materials . . and to get every possible ounce of work out of the motor trucks available to you.

How? By having your trucks work as mechanical horses and *pull* their loads on Trailers. Any motor truck, *pulling a Trailer*, can haul two to four times as big a load as it is designed to *carry*. And conversion of your trucks into "tractors" to pull Trailers is simple.

The shortage of motor trucks will probably continue long after the war, so it will be wise to make your transportation plans on a long-time basis . . and to get two, three or four times as much work from your trucks by having them pull Trailers.

Naturally, your savings in money are almost in proportion to the extra work your trucks accomplish.

World's Largest Builders of Truck-Trailers

FRUEHAUF TRAILER CO., DETROIT

Service in All Principal Cities

FRUEHAUF TRAILERS

"ENGINEERED TRANSPORTATION"

DOUBLE DUTY
DOUBLE-QUICK ACTION

No. 588
125-lb valve with two outboard bearings and handwheel control.

No. 587
Power operated by air diaphragm motor. Hand wheel for use in case of power failure.

15 to 900 psi
for air, gas, steam, liquids and semi-solids. Substitute metals are available for resistance against heat, abrasion and corrosion.

Throughout American Industry, Butterfly Valves have long been recognized as the ideal type for the control of volume and pressure. With the improved R-S precision machined—wedge type design, these valves are also used with equal effectiveness for the shut-off of any material that flows or is forced through a pipe.

The beveled vane seats at an angle against the valve body and tends to close itself under a pressure drop. Four to six revolutions of the hand wheel completely open or close the valve vane—that's double-quick action. Manually or power operated under pressures up to 900 pounds and from extremely high temperatures to sub-zero refrigeration conditions. R-S Butterfly Valves meet today's need for non-complicated construction, simplified operation and lower over-all costs. Write for detailed specifications.

VALVE DIVISION
R-S PRODUCTS CORPORATION
116 Berkley St., Philadelphia 44, Pa.

R-S Streamlined BUTTERFLY VALVES

Natural gas pipeline Tex. to W. Va. OK'd

Plans for the country's longest natural gas pipeline—to pump fuel 1,200 miles from the Southwest's gas fields to steel plants of the Appalachians—won approval from the War Production Board on Aug. 30.

Two applications to build the line are pending before the Federal Power Commission. The WPB action grants priority on getting necessary materials once the FPC acts.

WPB said the natural gas line would be needed in the Appalachian industrial area by the winter of 1944-45 "to prevent interruption in war production that would otherwise occur." It told the power commission it would make materials available to start construction of the line late this year.

The proposed pipeline would send 200,000,000 cu. ft. of gas daily from the Southwest's wells into the East. Its capacity could be stepped up to 300,000,000 cfd.

WPB officials said the proposals before the FPC were about equal so far as length, capacity, required materials and labor are concerned.

One application—filed by the Tennessee Gas and Transmission Co.—would originate the pipeline near Corpus Christi, Texas, and run it through Louisiana, Alabama, Tennessee and Kentucky to Cornwall Station, W. Va., whence the gas would be fed into steel mills and other industries.

The other line, proposed by the Hope Natural Gas Co., would start in the Hugoton field of Kansas and Oklahoma and extend east through the states of Missouri, Illinois and Kentucky to the same terminal.

BRIEF NEWS

Indicating that most of the military construction work in the eastern Ohio and western Pennsylvania area is over for the duration, Col. Gilbert Van B. Wilkes, United States Army district engineer at Youngstown, Ohio, has announced that he will reduce his organization's personnel considerably.

The reduction will include both commissioned and civilian personnel, he said, and only employees and officers essential from a military standpoint will be retained. The Youngstown area office is headed by Capt. Franklin B. Smith.

Two beer bottles filled with water recently comprised one of the most unusual shipments ever flown in the cargo hold of a clipper of the Pan American

CHECK THESE FEATURES OF DU PONT DELAY ELECTRIC BLASTING CAPS

In tunnel work and wherever rotation firing is desirable, you ll find that Du Pont Delay Electric Blasting Caps offer several exclusive advantages:

FIRST—The Plastic Insulation extruded on the wires—

Provides greater resistance to abrasion—much greater than impregnated cotton covered wires.

Assures dielectric properties equal to those of enameled wire.

Saves time because the smooth surface makes the wires easier to handle, and their brilliant yellow and red colors makes them easier to see.

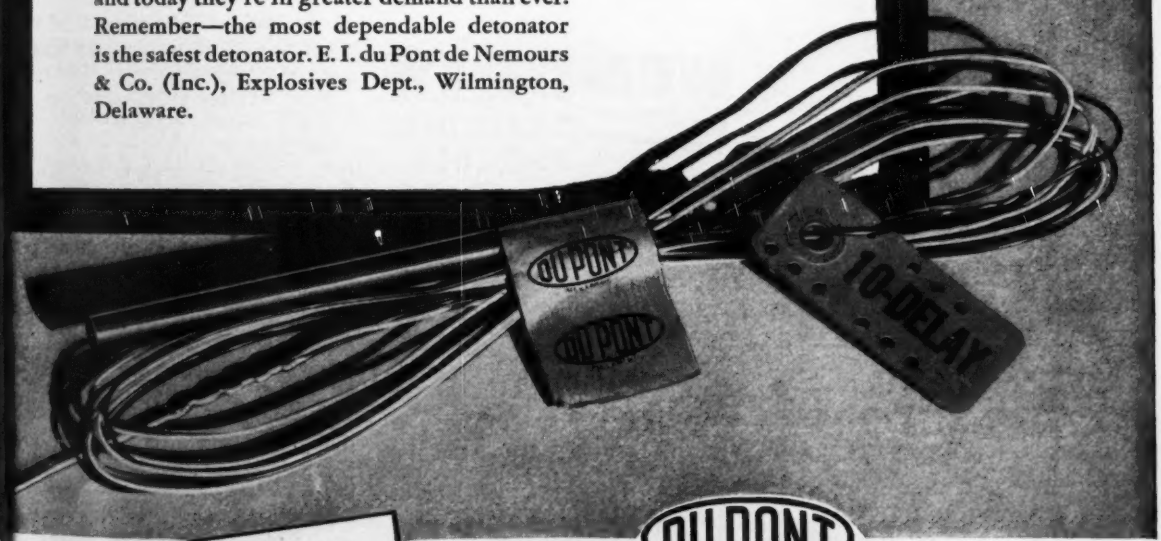
SECOND—The Rubber Plug Closure, which is double crimped right into the shell—

Results in a cap more highly water-resistant than any other.

Permits the use of cap shells shorter by over an inch, interval for interval—to make priming easier and safer.

Gives even greater dependability with the same explosive charge and strength.

Try Du Pont Delay Electric Blasting Caps. Millions of them have been used in the past, and today they're in greater demand than ever. Remember—the most dependable detonator is the safest detonator. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington, Delaware.



BACK THE ATTACK.
SUPPORT THE THIRD WAR LOAN DRIVE.
BUY MORE WAR STAMPS AND BONDS.

DU PONT
REG. U.S. PAT. OFF.

EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

to give you

greater digability and bigger pay loads!

We've taken the weight out of the bucket itself, to let you put bigger loads *inside.* Here's how: Because the HENDRIX Lightweight is 20 to 40 per cent lighter than other buckets, type for type, you can use larger buckets on your machines than that for which they were designed. The same holds true for long boom operations ... and in either case this can be done without exceeding the allowable loaded weight. In wet digging, you get bigger pay loads by leaving the water in the pit!

★ 20 to 40 per cent lighter than other buckets, type for type.

★ Manganese steel chains, fittings and reversible tooth points.

★ Perfectly balanced ... handles easier, fills faster ... dumps quicker, cleaner.

★ All welded construction ... for greater strength and durability.

★ Gets full load pay material every trip ... even in wet digging.

HENDRIX *Lightweight* **DRAGLINE BUCKETS**

⅜ to 20 cubic yards

Write for descriptive literature ... or ask your dealer ... today!

DeSoto Foundry, Inc., Mansfield, La.

World Airways System.

The water, a carefully-drawn sample from the Paraguay River, was needed for bacteriological examination in Rio de Janeiro, Brazil, and a New York engineering firm, Parsons, Klapp, Brinckerhoff and Douglas, was planning the first municipal water supply system for Paraguay's river-side capital of Asuncion. Careful analysis of the water was necessary and the analysis had to be made in Rio. Twelve hours after the sample had been drawn it would be useless for examination and the only way to meet the time limit was to rush the shipment by Clipper plane to Brazil.

A TVA-built terminal for river-borne freight was ready for operation in Chattanooga, Tenn., on Aug. 25. This $175,000 terminal with other units now under construction at Knoxville, Guntersville and Decatur, will give the Tennessee Valley what is described as the only unified terminal system in the country. Each terminal will provide facilities for temporary storage or transfer of river cargo to truck or rail lines.

The highway over which Washington's army marched from Morristown, N. J., to West Point in the Hudson valley has been relocated as part of a field project in surveying by Cooper Union civil engineering students. A section of this historic dirt road traversed by Revolutionary soldiers runs through Cooper Union property at the Green Engineering Camp in the Ramapo Mountains near Ringwood, N. J.

In 1905, S. Edgar March, of Bridgewater, N. S., joined the engineering staff of the Transcontinental Railway, then being surveyed between Moncton, N. B., and Winnipeg, Man. In 1915, he was appointed provincial land surveyor, and since then had been doing engineering and surveying on his own account. His four sons have all followed in their father's footsteps. Wade, the oldest, is assistant professor of civil engineering at the Nova Scotia Technical College, Halifax; Ruskin is a land surveyor for the

DRILLING CONTRACTORS

DIAMOND AND SHOT CORE BORINGS—DRY SAMPLE BORINGS

•

Foundation Testing for Bridges, Dams and All Heavy Structures

Also

Manufacturers of Diamond and Shot Core Drills, Accessories and Equipment

•

SPRAGUE & HENWOOD, Inc.

SCRANTON, PA. Dept. E U. S. A.

NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity-

** WRITE OR WIRE **

LA CROSSE TRAILER & EQUIPT. CO.

LA CROSSE, WISCONSIN U. S. A.

BAILEY METERS AND CONTROLLERS

FOR SEWAGE TREATMENT AND WATER SUPPLY ...

• Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

BAILEY METER COMPANY

1029 IVANHOE ROAD • CLEVELAND, O.

Bailey Meter Co. Ltd., Montreal, Canada

No other war had landing barges like these

nor the modern *Preformed wire rope* to handle them

To swing a landing barge over the side and set it safely down on the water—that's another new problem of this new, hard, global war. Again Preformed Wire Rope has been selected, this time for the rope and slings that handle the barges. There seems no end to the war uses of Preformed.

In peace, men learned that Preformed Wire Rope could be depended on for greater stamina, longer life, protection of men and equipment, and lower cost. In war, such qualities are indispensable. So at *all* times Preformed is given the hard jobs. For detailed reasons—

Ask your own wire rope manufacturer or supplier

BACK THE ATTACK ... WITH WAR BONDS

The Third War Loan must have your wholehearted support. Every surplus dollar should be invested in Bonds. The manufacture of Tanks, Planes, Ships, Guns, Bombs, Ammunition and Supplies must go on and on . . . and be increased. A shortage of this or that will mean the loss of more and more lives.

Bond purchasing is a sound business venture. The wealth of your Nation makes them safe. The freedom your dollars will help win will be beyond any dollar value that could be mentioned.

The Third War Loan is being enthusiastically backed by citizens from all walks of life. Industrialists welcome this safe source of investment for their unused capital and profits. We are all in this drive for victory—and we must win!

Our boys are giving their lives. They are enduring sweltering heat, muck, dust, rain and cold. They are not whimpering. They are expecting us to provide them with the implements of war. We must back their attack with our dollars and help them blast a path to Victory. Buy bonds today!

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada.

LAYNE
WELL WATER SYSTEMS
DEEP WELL PUMPS

Builders of Well Water Systems for every Municipal and Industrial Need

Nova Scotia lands and forest department; Henry is on the surveying staff of the Nova Scotia Timberlands at Yarmouth; Stephen is on the engineering staff of the Foundation Maritime Company, general contractors, Pictou, Nova Scotia.

A new state law in Ohio, effective Sept. 3, permits the state highway director to keep secret the cost estimates on proposed highway projects until after bids have been submitted. It also abolishes the restriction prohibiting the award of contracts on bids that are more than 10 percent above the department's estimate.

The Wilmington, N. C., District of U. S. Engineer office and its sub-offices throughout North Carolina have just received praise for their outstanding safety record. H. H. Hunt, safety engineer for the Atlanta Division of the U. S. Army Engineers Corps, recently reported that each month for the past six months the Wilmington District has led the entire South Atlantic Division in accident prevention. The division includes the Wilmington, Charleston, Jacksonville, Savannah, Mobile and Atlanta Districts.

A total of 1,470 new war houses is now under construction in Jacksonville under an FHA program it was announced Aug. 24 by W. H. Burns, manager of the local War Housing Center. One-third of the new dwellings being constructed under the FHA program will be for sale and the balance will be rental property. Mr. Burns disclosed that 883 new houses have been completed since the first of the year and that 1,275 additional houses will be under construction by Dec. 31. All new houses have been strategically located in places easily accessible to defense plants.

A reduction of 265 office personnel in the U. S. District Engineers' office at Louisville, Ky., including the suboffices, was ordered in August. However, the matter was simplified by 90 resignations either to enter the army or to take other positions. The spending has returned to normal and the outlook for about a $5,000,000 year is in prospect compared with approximately $300,000,000 last year. Many thousands of construction workers went to other work as the big wartime construction program in that district tapered off six months ago.

The Civil Engineer Corps of the Navy, composed since 1867 of highly trained engineers, has accepted its first woman officer as a full-fledged member. She is Ensign Kathleen F. Lux of Logansport, Ind. She holds a civil engineering degree from Purdue University. After leaving college she worked with the Indiana State Board of Health in sanitary engineering, and joined the Waves in March, 1943.

The greater the need for accuracy...

... the greater the need for ARKWRIGHT TRACING CLOTHS!

If details and figures are not reproduced sharply, it's hard for mechanics, working at top speed, to follow blueprints without error. That's why it pays to use Arkwright Tracing Cloths for important drawings. Arkwright Cloths are highly transparent. And, as a result, details and figures on blueprints made from them stand out sharp and clear ... are easy to follow. Remember–where accuracy is vital, use Arkwright Tracing Cloths! Arkwright Finishing Company, Providence, R. I.

Arkwright
TRACING CLOTHS
AMERICA'S STANDARD FOR OVER 20 YEARS

Cities Service Announces

A NEW ENGINEERING SERVICE FOR DIESEL OPERATORS

CITIES SERVICE DIESEL HEAT PROVER TEST SHOWS OPERATORS OF A. C. DIESEL GENERATORS THESE VITAL POINTS

1. INDIVIDUAL CYLINDER H. P. OUTPUT.
2. INDIVIDUAL CYLINDER COMPRESSION.
3. INDIVIDUAL CYLINDER PEAK PRESSURES.
4. FUEL INJECTION TIMING.
5. MECHANICAL CONDITION OF PISTON AND RINGS.
6. EXACT FUEL ECONOMY.

help Diesel operators obtain the greatest possible duction at the lowest possible operating cost—ies Service introduces a scientific new "HEAT OVER" engineering service.

rough this new "HEAT PROVER" service it is possible for you to determine exactly the opera- efficiency of your Diesel equipment and to make necessary adjustments long before trouble ever rts. This service is available on request, in most of important industrial cities East of the Rocky untains.

ts already have resulted in considerable savings in and overhaul costs to many operators. So to make your Diesels are in perfect working order, ask for IESEL HEAT PROVER test of your equipment y. There is no cost or obligation. Write to Cities vice Oil Company, Room 1731, Sixty Wall Tower, York 5, N. Y.

THE CITIES SERVICE DIESEL HEAT PROVER is easily portable—can be used without interrupting operation of equipment. Here it is connected with the engine's generator—and is being used to take a sample of gas at the exact moment when an exhaust port opens.

OIL IS AMMUNITION—USE IT WISELY!

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO
IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.

SMITH HYDRANTS

THE A.P. SMITH MFG. CO. EAST ORANGE, N.J.

Symbol of Quality Since 1889

PROTECTOP

Trucks and motor cars back into fire hydrants every day. When this happens to a Smith Protectop Hydrant the break occurs only at one place and the only parts needing replacement are the frangible standpipe clamp and the frangible cast iron stem section. These parts cost comparatively little and they make it easy for full repairs in 15 minutes. The valve is of the compression type and even should it be open at the time of the break, it will instantly close, preventing any possibility of flooding. Made in all sizes and types.

THE HYDRANT THAT CAN BREAK AT ONLY ONE PLACE

OTHER SMITH PRODUCTS

Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters

Write for Catalog

Branches

7 So. Dearborn St., Chicago, Ill.
400 Texas St., El Paso, Texas
315 N. Crescent St., Flandreau, S. D.
901 Wm. Oliver Bldg., Atlanta, Ga.
Easton Building, Thirteenth & Broadway, Oakland, Calif.
524½ First Ave. S., Seattle, Wash.
1317 Oakley St., Orlando, Fla.

THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

STERLING HOISTS

YOU'LL GET BETTER RESULTS WITH STERLING

WRITE FOR LITERATURE

Simple, Dependable, Rugged—Sterling Hoists, Pumps, Light Plants are the choice of leading users.

STERLING MACHINERY CORP.
4051 3 Southwest Blvd. Kansas City, Mo.

DRILLING ANYWHERE

We look into the earth

PENNSYLVANIA DRILLING COMPANY
PITTSBURGH, PA.

MEETINGS

NATIONAL SAFETY COUNCIL, 32nd annual Safety Congress, 20 North Wacker Dr., Chicago, Ill., Oct. 5-7.

AMERICAN PUBLIC HEALTH ASSOCIATION wartime conference and 72nd annual business meeting, Hotel Pennsylvania, N. Y., Oct. 12-14.

AMERICAN WELDING SOCIETY, 24th annual meeting, Hotel Morrison, Chicago, Ill., week of Oct. 18.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, Westchester Country Club, Rye, N. Y., Oct. 19-21.

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT, 11th annual meeting, American Society of Civil Engineers, 33 West 39th St., New York, N. Y., Oct. 21-23.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, Hotel Sherman, Chicago, Ill., Oct. 21-23.

NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS, annual meeting, Lincoln Hotel, Indianapolis, Ind., Oct. 25-26.

AMERICAN PUBLIC WORKS ASSOCIATION, Hotel Sherman, Chicago, Ill., Oct. 25, 26 and 27.

INDUSTRIAL HYGIENE FOUNDATION, 69th annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 10-11.

REGIONAL AND LOCAL MEETINGS

TENNESSEE HIGHWAY USERS CONFERENCE, Nashville, Tenn., Sept. 27.

NEW ENGLAND WATER WORKS ASSOCIATION, Hotel Statler, Boston, Mass., Sept. 28-29.

NEW YORK SECTION, AMERICAN WATER WORKS ASSOCIATION, fall war conference, Hotel Arlington, Binghamton, N. Y., Sept. 30-Oct. 1.

NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE, Grand Forks, N. D., Oct. 5-7.

SOUTHWEST SECTION, WATER AND SEWAGE WORKS MANUFACTURERS ASSOCIATION, INC., Oklahoma City, Okla., Oct. 11-13.

At the sound of this bell...

will your firm be among those se-
d to handle the big job of "building
new worlds" already on America's
truction schedule? Has your firm
ed a reputation for completing jobs
me—economically—safely—to the
faction of the buyer—that will bring
your share of tomorrow's business?
nerican Mutual has been helping
tractors for years, through peace times
war times alike. With its broad, de-
d knowledge and experience in the
truction field it can help you now,
hen peace comes.

nerican Mutual is known as the in-
ce company that gives its contrac-
olicyholders the Five Extras — *ac-
bility, services, *economies through
tions, savings through dividends,
plete protection against loss.* It offers
hese Five Extras which will be so
rtant to your securing and handling

*ends to policyholders have never been less
20%.*

tomorrow's big jobs—housing projects, airport construction, industrial reconstruction, public works.

One example of how American Mutual helps its contractor-policyholders is its famous accident-prevention book, "Foremanship and Accident Prevention in Construction," now being used by thousands of construction foremen throughout America. It's a practical, result-getting manual of safety your foreman will appreciate. A copy of this book will be sent on request.

Prepare yourself now for the important jobs to come; make American Mutual your partner in "new world building." Why not write for a copy of our "Five Extras" booklet outlining the complete story of American Mutual and why it has become a leading insurer among contractors. Address Dept. o-26. American Mutual Liability Insurance Company, 142 Berkeley Street, Boston 16, Massachusetts.

© 1943, AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

Your helping hand in building these "new worlds"

AMERICAN MUTUAL

... the first American liability insurance company

Tunnel Driven without Compressed Air!

• *Predrained with* **STANG** *Wellpoints*

STANG RESULTS GUARANTEED ★

Driving an open tunnel at atmospheric pressure through water bearing sand was simplified, speeded and economized by the use of STANG Wellpoints jetted below the tunnel line through pre-cut holes in steel liner plates. That's the whole story. Wherever YOU want to drive a tunnel this way—or to excavate "in the dry" without sheeting or hazards in any water-bearing soil—use STANG Wellpoints backed by STANG Engineering, installation and operation service.

Contact our Nearest Branch — Write for Catalog

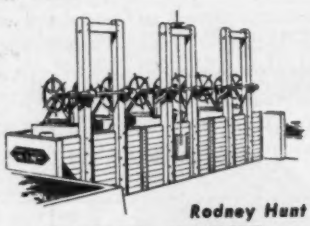
JOHN W. STANG CORPORATION

Engineering Manufacturers of Dewatering Equipment

TWO BROADWAY, NEW YORK CITY (Zone # 4)

SAN DIEGO, CAL. — **HOUSTON, TEXAS**

EXCAVATE "IN THE DRY"



Rodney Hunt

SLUICE GATES

Are you interested in metal or timber sluice gates? Also hoists, stands or other water controlling apparatus? Rodney Hunt has over 100 years' experience making this type of equipment.

Write for special catalog today.

RODNEY HUNT MACHINE COMPANY
79 Lake St. Orange, Mass., U. S. A.

CUSTOM BUILT GEARS of all Types and Sizes

For more than forty years we have specialized in cutting spur, bevel, spiral, and worm gears in all practical materials and sizes from ½" to 30 ft. in diameter.

THE EARLE GEAR & MACHINE CO.
4717 Stenton Ave., Philadelphia, Penna.

EARLE GEARS

MISSOURI VALLEY SECTION, AMERICAN WATER WORKS ASSOCIATION, Des Moines, Iowa, Oct. 12-15.

FOUR-STATES SECTION, AMERICAN WATER WORKS ASSOCIATION, joint meeting with Pennsylvania Water Works Operators' Association, wartime waterworks conference, Benjamin Franklin Hotel, Philadelphia, Pa., Oct. 14-16.

WISCONSIN SECTION, AMERICAN WATER WORKS ASSOCIATION, Milwaukee, Wis., Oct. 19-20.

CALIFORNIA SECTION, AMERICAN WATER WORKS ASSOCIATION, Biltmore Hotel, Los Angeles, Calif., Oct. 27-29.

CANADIAN INSTITUTE ON SEWAGE AND SANITATION, annual convention, General Brock Hotel, Niagara Falls, Ont., Oct. 28-29.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA, fourth annual water conference, William Penn Hotel, Pittsburgh, Pa., Nov. 1-2.

NEW JERSEY SECTION, AMERICAN WATER WORKS ASSOCIATION, fall meeting, Hotel Madison, Atlantic City, N. J., Nov. 4-6.

Elections and Activities

A new organization to replace the defunct Southern Ohio Chapter of the Ohio Society of Professional Engineers has been formed at Chillicothe, Ohio. Officers elected are P. E. Fuller, president; G. Murray Anderson, vice president; Elmer S. Barrett, secretary, and Alvin Hoffman, treasurer.

Harry C. Anderson, assistant chief engineer, Department of Public Works, Victoria, B. C., has been elected director of the newly incorporated British Columbia Engineers Society.

T. H. Gardner, structural engineer for the Florida East Coast Railway, has been elected chairman of the board of the Florida Section of the American Society of Mechanical Engineers for the current year.

Lt. Col. A. D. Hughes of the Pacific division of the U. S. Army Engineers was elected president of the Utah post, Society of American Military Engineers, succeeding Arthur L. Thomas, Jr. Lt. Col. L. W. Nims, war department power coordinator for the Ninth Service Command, was elected vice president; J. H. Tempest, contractor, was elected treas-

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

WATER SUPPLY

POSED WORK

...., Groton—Boro of Groton, Water Dpt., ... Thames St., 6,500 ft. 6 and 8 in. pipe ... 10 in. connection Eastern Pt. Rd., Shen... ...ett Rd., Plant St., Bill Ave. $20,000. ...alf & Eddy, 1300 Statler Bldg., Boston. ..., engrs.

...., Walsenburg—WW imprvs. $125,000.

..., Albertis—Boro Council, Thos. Beitel, ... water supply sys. expansion, drilling ... well or wells, etc. Over $15,000.

Tenn., Carthage—City, J. W. Alexander, ... water filtration plant, exten. distr. sys. ...000. FWA.

†Tex., Houston—Federal Works Agency, ...702 Electric Bldg., Fort Worth, fresh ...er supply and distr. sys. $550,000.

Va., Norfolk—City Manager, City Hall, ...completed preliminary plans water supply ... distr. mains. $1,239,000.

...., Strathroy—Watermain construction, ...ans. $36,000. Utilities Comn., Strathroy, ...ta.

...S ASKED

Bids Asked about October 15

..., Bucyrus—O. Denny, city service dir., ...ng 4,000 ft. pipe to rebuild old wooden ...line between 2 reservoirs. $25,000. CD ...41—ENR 7/9/42.

Bids Asked

...N. C., Elizabeth City—Federal Works ...ncy, 601 State Planters Bank Bldg., Rich... ...d 19, Va., addnl. WW sys. filtration, etc. ...s deposit $5. Extended date, Pierson & ...itman, Security Bank Bldg., Raleigh, engrs. ...8/20—ENR 8/26.

...W BIDDERS

...Conn., New Britain—City Bd. Water ...rs, City Hall, Sept. 17, pump. station, in... ...ing 2 diesel engines, Group 1, from Geo. ...Buteau, 90 Cloran St., Springfield, Mass., ...806. FWA. CD 9/9.

...nd., East Chicago—Bd. Water Trustees, ... Hall, Sept. 14, water purification im... ...n, 780 ft. c.i. watermain, Ind-12-142, from ...ucci Constr. Co., Le Claire Ave., Skokie, ... $28,800 using 24 in. pipe main, $32,800 ...r 30 in. c.i. pipe main. Est. $80,000. FWA. ...9/8—ENR 9/16.

...NTRACTS AWARDED

...., Vandalia—Watermain enlargement, ex... ...on north side of city, to W. L. Hall, At... ...d. $40,000. CD 6/4—ENR 6/10.

...o., St. Charles—City, c/o W. G. Oelklaus, ...er supt., 1 m.g. rein.-con. tank for water ... to J. J. Wuellner & Son, Oak and Front ...s, Alton, Ill. $39,800. W. Haltman, 101 ...Main St., engr. CD 8/24—ENR 9/2.

...New Jersey—U. S. Eng., 120 Wall St., New ...rk 5, N. Y., deep feeder sys. to pumphouses, ...ison Co., to John C. Morris Co., 2854 Hud... ...Blvd., Jersey City, $25,000. Bids 8/14. CD ...3, under Unclassified.

...Oklahoma—U. S. Eng., 416 Wright Bldg., ...ma. Zone 2, W.W. pumphouse, Oklahoma ... to Lippert Bros., Braniff Bldg., Okla... ...a City, $10,000. Awarded 9/13. CD 8/4— ...7 8/12.

...Oklahoma—U. S. Eng., 416 Wright Bldg., ...ma 2, water wells, Contr. 957-eng-2095, ...ahoma Co., to C. H. Staats, c/o C. H. ...ats Drilling Co., Oklahoma City, $20,000.

...Texas—U. S. Eng., 416 Wright Bldg., ...ma 2, Okla., pump house, water supply ... deep water supply well, Sol. 957-neg-... Gray Co., to Sherman Machine & Iron ...rks, 24 E. Main St., Oklahoma City, Okla., ...000.

...nt., Preston—Well drilling, to Interna... ...al Water Supply, Ltd., 12 Maitland St., ...onto. Est. $20,000. Light & Water Comn., ...n Hall, engr.

...ec., St. Johns—H. Morais, town clk., filtra... ...plant addn., to J. P. Trahan, 173 Mercier ...., $22,935. CD 8/25—ENR 9/2.

SEWERS, WASTE DISPOSAL

...POSED WORK

...olo., Lakewood—Federal Works Agency, ... Santee St., Los Angeles, Calif., bids soon ...00 lin. ft. vitr. clay sanitary sewer line ... Lakewood Sanitation Dist. $250,000. ...ity Bros. Eng. Co., Mining Exchange ..., Denver, consult. engr. CD 9/29/42— ...d 10/1/42.

...nd., Fort Wayne—Bd. P. Wks., R. G. ...ams, chn., City Hall, making plans storm ...er, $175,000. C. R. McAulis, city engr.

Location of ENR Correspondents

Symbols and Abbreviations Include:

♦	Federal Government
★	Project of $500,000 or over
ENR	Engineering News-Record
CD	Engineering News-Record Construction Daily
A-E-M	Architect-Engineer-Management type of contract

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply	Unclassified
Sewers, Waste Disposal	Latin America
Bridges	Public Buildings
Streets & Roads	Commercial Buildings
Earthwork, Waterways	Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR); LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

†Kan., Parsons—City will not construct sewage plant. $167,520. FWA. Project withdrawn after FWA approved allotment. CD 8/27—ENR 9/2.

†N. C., Aberdeen—Town, F. Lockey, mayor, addnl. sewerage facilities for housing development, Wolf Pit Ave. $7,000. FWA. P. M. Van Camp, Southern Pines, engr.

O., Cedarville—Village Council, bond election to finance modern sewage disposal sys. Over $25,000.

★**Tex., Fort Worth**—S. H. Bothwell, city mgr., sewage disposal plant for Northside area. $540,000. Applying for FWA funds.

★**†Tex., Houston**—Federal Works Agency, 702 Electric Bldg., Fort Worth, sanitary sewage disposal sys., lines, facilities, $676,000.

Ont., St. Thomas—Storm sewers, extens. $25,000. W. C. Miller, City Hall, engr.

†Tex., Pasadena—D. L. Atkinson, mayor, City Hall, sanitary sewerage sys. exten., incl. mains, disposal, etc., Tex. 41-246, $200,000, FWA. Garrett Engineering Co., 1806 Milam Bldg., Houston, engrs.

★**Ont., Toronto**—F. J. Conboy, mayor, sewage disposal plant unit, incl. 1,385 ft. seawall, in front of Ashbridge Bay. $1,700,000. Gore & Storrie, 1130 Bay St., engrs.

BIDS ASKED

Bids Asked September 27

N. Y., New Gardens—President Queens Boro, Queens Boro Hall, 120-55 Queens Blvd., sewer, appurtenances 57 Rd.; sanitary sewer, appurtenances 5 and 111 Aves., 164 Pl., Baisley Blvd., 119 Rd., 180, 157 and Terry Sts.; combined sewer, appurtenances 67 Ave., 169 and 171 Sts.

Bids Asked September 29

Que., Montreal—Executive Com., City Hall, Montreal, replacing pump. unit, appurtenances, for J. A. Mongeau, municipality clk.

Bids Asked October 1

Minn., Browerville—H. Brenny, village recdr., sewage disposal plant, sewage collecting sys. Over $50,000 (unofficial). C. Foster, 316 Medical Arts Bldg., Duluth, engrs.

Bids Asked about October 1

†Utah, Clearfield—Town, G. H. Holt, pres., Town Bd., sanitary sewer. $186,000. FWA. Extended date. S. Margetts, Felt Bldg., Salt Lake City, engr. CD 9/2—ENR 9/9.

Bids Asked October 4

Md., Towson—Comrs. Baltimore Co., Courthouse, Contr. 77-S, 18,450 lin. ft. 8 and 10 in. vitr. sewer, manholes, appurtenances. Plans deposit $5, Geo. Wm. Stephens, Jr., Courthouse, engr.

Ont., Toronto—H. D. Goode, clk. North York Twp., Toronto, 480 ft. 10 in. sewers in Yonge Blvd., 1,200 ft. 12 in. Henry St., 2,300 ft. 13 in. Lawrence Ave. W., 625 ft. 10 in. Denister Ave. About $25,000. G. H. Baker, c/o owner, engr.

†Connecticut—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., (selected bidders) sewage disposal sys., No. 44-29, Hartford Co. CD 9/17.

LOW BIDDERS

Md., Hyattsville—Washington Suburban Sanitary Comn., Hamilton St., Sept. 10, sewers, Contr. 147-S, from J. Matricciani & Sons, 229 S. Exeter St., Baltimore, $47,387. CD 8/24—ENR 8/26.

CONTRACTS AWARDED

†Calif., Fallbrook—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., repair storm drainage, erosion control and drainage, N.A.D., NOY 6926, to Frank T. Hickey, Inc., 1111 N. Sycamore Ave., Los Angeles, $149,292.

†Florida—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, addnl. drainage facilities, Neg-Jax-44-197, Orange Co., to Langston Constr. Co., 115 W. Grant Ave., Orlando. $30,000. Awarded 9/16.

†Georgia—U. S. Eng., Post Office Bldg., Savannah, sewer and water distr. sys., Contr. 819-eng-6006, Cobb Co., to Nichols Contg. Co., 1190 Caroline St. N.E., Atlanta, $70,000.

Mich., Grosse Pointe Woods—P. F. Allard, village clk., 1,600 ft. 36 in. storm sewer and 1,600 ft. drainage ditch, to Moran & Teetaert, 920 Neff Rd. Est. $25,000. Pate & Hirn, 432 Michigan Bldg., Detroit, engrs. CD 6/4—ENR 6/10.

†O., Osborn—S. S. Schauer, village clk., sewage plant addn., to Hanagan Bros., Urbana. $175,617. FWA. Bids 9/4. CD 8/20.

†Texas—U. S. Eng., Albuquerque, N. M., addnl. sewer line, El Paso Co., to Rob. E. McKee, P. O. Box 217, El Paso, under $50,000. Bids 9/13, awarded 9/14. CD 9/8.

Tex., Taylor—H. G. Richards, mgr., sanitary sewer mains, force account, $25,000.

Va., Pearisburg—Sewerage and water sys., addns., extens. to Van Doren Brothers, 2911 Hawthorne Ave., Richmond, $63,150. Bids 7/7. CD 8/25—ENR 9/2.

Ont., Mille Roches—Cornwall Twp., c/o V. A. McDonald, R. R. 1, Mille Roches, sewer construction, extens., day labor. $25,000.

BRIDGES

PROPOSED WORK

Conn., Lyme—New York, New Haven & Hartford R. R., E. E. Oviatt, ch. engr., New Haven, altering 3 railroad bridges, Waddell & Hardesty, 101 Park Ave., New York, N. Y., engrs.

Conn., New London—New York, New Haven & Hartford R. R., E. E. Oviatt, ch. engr., New Haven, railroad bridge, Waddell & Hardesty, 101 Park Ave., New York, N. Y., engrs.

Illinois—State Div. Hys., Springfield, rejected bids July 30, reconstructing portion I-beam bridge over Wolf Lake on Route 57 north of Chandlerville, Sect. 144R-B, 42P, FAP 167E(2), Mason Co. CD 8/6—ENR 8/13, under LB.

PEACE-TIME TANKS IN WAR-TIME SERVICE

The wide spread use of the automobile had a great deal to do with the development of the manufacture of carbon black into a major industry. A large percentage of the carbon black produced in the United States is used in the manufacture of tires.

The increasing demand for tires—and subsequently carbon black—fifteen years ago, ten years ago, and even five years ago, resulted in improvements in the methods of producing carbon black and increases in the capacity of the plants using these methods.

The methods of storing and handling carbon black were also improved. Leading producers installed large cone-bottom steel tanks like the two shown above holding 1,000,000-lbs. each. They are equipped with conveyors which withdraw the contents through the cone bottoms for shipment economically.

War production has, as in many other fields, increased the demand for carbon black. Furthermore, there has been no successful substitute developed for it in the manufacture of tires. The shortage of carbon black is today one of the four bottlenecks in the production of synthetic tires.

The manufacturers of carbon black are producing all they can and, no doubt, will eliminate this bottleneck soon. Steel tanks like those shown above, installed for peace-time production, are being used to meet war demands at many industrial plants.

Write our nearest office for information on deliveries when in need of steel tanks, bins or pressure vessels.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4 .....2101 McCormick Bldg.
New York 6 .....3311-165 Broadway Bldg.
Cleveland 15 .....2201 Guildhall Bldg.
Philadelphia 3 ..1623-"1700" Walnut St. Bldg.
Tulsa 3 .....1617 Hunt Bldg.
Birmingham 1 .....1520 North Fiftieth Street
Washington 5 .....330 Bowen Bldg.
Houston 1 .....5609 Clinton Drive
San Francisco 5 .....1020 Rialto Bldg.

Plants in BIRMINGHAM, CHICAGO, and GREENVILLE, PENNA. In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

ere are 10 basic books day-in-day-out value ONE low-priced volume

book is carefully planned to give the rmation needed by men who actually , select, design, and construct civil neering structures and projects—in one pact volume and at a reasonable price. new 1940 edition blends theory, prac- and fundamentals equally; and an- your questions in *any* division of engineering.

CIVIL ENGINEERING HANDBOOK

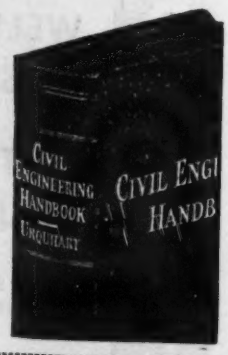
or-in-chief: L. C. Urquhart, Professor tructural Engineering, Cornell Univer- 2nd edition. 870 pp., illus., $5.00.

e are the fundamentals of the various divisions of civil engineering for the of practicing engineers confronted with ific problems, particularly those out- their specialized fields. The book you ten complete treatises on the major subdivisions of civil engineer- each written by a specialist of inter- nal reputation in his field.

IG SECTIONS

ay and Highway neering
nics of terials
alics
es in ed Structures
Design
ete
ations
ge and Sewage posal
Supply and ification

IT 10 DAYS



SEND THIS COUPON TODAY
-GRAW-HILL BOOK CO., INC.
0 West 42nd Street, New York City

nd me Urquhart's Civil Engineering Handbook 10 days' examination on approval. In 10 days will send $5.00, plus few cents postage, or re- m book postpaid. (Postage paid on orders ac- mpanied by remittance.)

me .....
ddress .....
y and State .....
sition .....
mpany .....NR. 9-23-43

BRIDGES, etc. (Proposed Work, Cont'd.)

Indiana—State Hy. Comm., Indianapolis, received no bids Sept. 14, new concrete floor, 1 span, 220 ft. steel truss bridge over Mississinewa River, Contr. 2421, Grant Co.; one 20 ft. span rein.-con. arch bridge over Pursley Creek, Contr. 2412, Blackford Co. Will readvertise. R. Bower, state hy. engr. CD 8/30—ENR 9/2.

Man., Whitemouth—Bridge over Whitemouth River, at Elma, near here. $25,000.

Ont., Port Arthur—United Grain Growers Ltd., Hamilton Bldg., Winnipeg, Man., trestle reconstruction, $65,000.

Quebec—Dpt. Mines & Resources, Quebec City, bridge over narrows between Lake Chassignole and Lake Preissac, near line dividing twps. of Bousquet and La Pouse, in Lake Chassignole, Abitibi Co. $85,000.

BIDS ASKED

Bids Asked October 1

Arkansas—J. H. Crain, chn., State Hy. Dpt., Little Rock 0.295 mi. grading, minor drain structures, concrete pavement and about 1,532 ft. rein-con. deck girder bridge, Sebastian Co. $300,000. W. W. Mitchell, Little Rock, engr.

Wisconsin—State Hy. Comm., Madison, Oak St. bridge, State Trunk Hy. 70, Contr. 1, S. P. 5798, Sparta, Monroe Co. Plans deposit $1. CD 6/22—ENR 6/24, under Sparta.

Bids Asked October 8

Minnesota—State Hy. Dpt., St. Paul, one C 55x108 ft. concrete box culvert, SP 5407-04 (TH75-6); one C 28x57 ft. concrete box culvert, SP 5407-05(TH 75-6) both 2½ mi. west of Ada; one C 40x64 ft., SP 6010-06(TH 75-6, at Beltrami; one C 46x50 ft. concrete box culvert, SP 1916-06(TH 88-1), 4⅛ mi. north of Rosemount. O. L. Kibb, St. Paul, ch. engr.

LOW BIDDERS

Georgia—State Hy. Dpt., Atlanta, Sept. 10, widening 2 bridges at Echoconnee Creek and widening 0.242 mi. shoulders and paved approaches at bridge ends on Macon-Hawkinsville Rd., Houston and Bibb Counties, from C. L. Rhodes, 215 Atlanta Ave., Atlanta, $60,-358.

New Jersey—State Hy. Dpt., Trenton, Sept. 13, grade separation, Essex Co., from Union Building and Constr. Co., 631 Main Ave., Passaic, $346,529. CD 9/9.

CONTRACTS AWARDED

Florida—State Rd. Dpt., Tallahassee, 7 bridges and surfacing 13 mi. road 79 between Bartow and Lake Wales, Polk Co., to Marion Constr. Co., Ocala, $289,406. Bids 9/14, awarded 9/16. CD 8/31—ENR 9/2.

†**Mississippi**—U. S. Eng., U. S. Post Office & Courthouse, Vicksburg, bridge piers and trestle work in relocation of U. S. Hy. 51, across Coldwater River, Arkabutla Reservoir, De Soto and Tate Counties, to E. O. Korsmo Constr. Co., 72-74 Porter Bldg., Memphis, Tenn., over $100,-000.

★**Tex., Langtry**—Southern Pacific Lines, R. W. Barnes, ch. engr., 916 Southern Pacific Bldg., Houston, rein.-con., structural steel cantilever type railway bridge over Pecos River, for T. & N. O. Ry., to Brown & Root, P. O. Box 1139, Houston, approx. $800,000. Addnl. to CD 8/11—ENR 8/19, under CA.

Que., Eaton—C. H. Picard, municipality clk., rein.-con. bridge, approaches, etc. at Lake's Mill, etc. to G. W. Lennon, 7 Main St., Inverness. Est. $25,000. Bids 9/8.

STREETS AND ROADS

BIDS ASKED

Bids Asked September 27

D. C., Wash.—District Comrs., District Bldg., concrete paving 16,000 sq. yd. alleys.

N. J., Laurel Springs—Boro, Boro Hall, bituminous surfacing 31,783 sq. yd. Camden Co. M. N. Hammon, 301 Market St., Camden, engr.

Bids Asked September 28

Mo., St. Louis—Melrose Sewer Dist., J. Quinn, pres., E. Hanson, secy., 4625 Ravenwood Ave., replacing bituminous on waterbound macadam pavement over certain sewer ditches. G. A. Russell, 4625 Ravenwood Ave., engr.

N. Y., Syracuse—At office Executive Dept., Div. Military & Naval Affairs, State Capitol Bldg., Albany, roads, walks and grading-pavement in Drill Hall Field Artillery Armory. Est. Proposal 1 $13,724, Proposal 2 $7,302.

Bids Asked September 29

Louisiana—State Hy. Dpt., Baton Rouge, 2,525 cu. yd. pit run gravel to be furnished, loaded, hauled and spot dumped, S.P. 703-00-13, Evangeline Parish; 10,170 cu. yd. pit-run gravel mined, hauled and spot dumped, S.P. 703-00-39, Catahoula Parish; 2,000 cu. yd. clam shell or 2,535 cu. yd. reef shell to be furnished and spot dumped on Warren-Canal-Forked Island Rd., State Rt. 26, S.P. 207-01-04, Vermilion Parish. Extended date. CD 8/31—ENR 9/2.

LEADITE

The Pioneer Self-Caulking Material for C. I. Pipe

TABLE OF COMPARATIVE QUANTITIES

Nominal inside dia. of Pipe, in.	Depth of joint, inches of Leadite	Approx. lbs. of Leadite per joint	Depth of joint, inches of lead	Approx. lbs. of lead per joint
4	2.5	2.00	2.25	8.56
6	2.5	3.00	2.25	11.71
8	2.5	4.00	2.25	14.63
10	2.5	5.00	2.25	17.70
12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
36	2.75	19.00	2.50	77.96
48	3.50	30.00	3.00	121.15
54	4.0	38.00	3.00	135.60
60	4.0	42.00	3.00	150.70

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

DUAL PRIME CENTRIFUGAL PUMPS

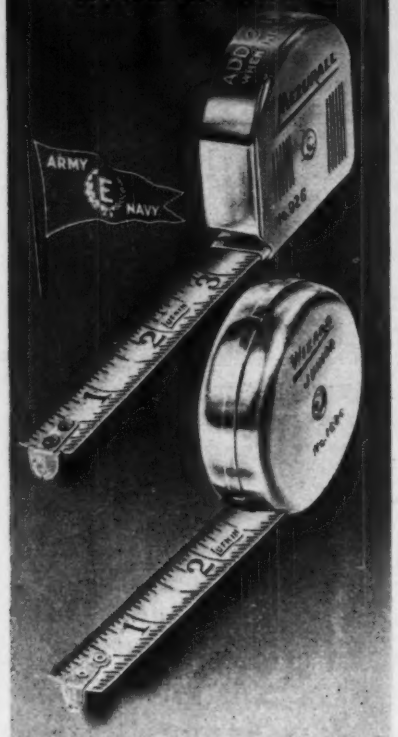
EXTRA SERVICE FROM PRESENT EQUIPMENT!

The simple design and ease of maintaining and servicing CMC equipment are features that mean money in the pockets of owners today. Your nearest CMC distributors is ready to help you get EXTRA SERVICE from your present equipment. Call on him.

CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA
Cable Address—OPARO, N. Y.

LUFKIN

TAPE RULES THAT EVERY ENGINEER SHOULD HAVE



Every busy engineer needs a Lufkin Mezurall or Wizard Jr. steel tape rule for his vest pocket—where it's handy and ready for those dozens of little measuring jobs that come up every day.

Ideal for general measuring work—inside, outside, height or depth. They're accurate for both hook or butt end measurements. Six feet long, they remain rigid when extended yet will wrap around corners or curves with ease. Write for free catalog.

BUY THROUGH YOUR DISTRIBUTOR

LUFKIN

SAGINAW, MICHIGAN • New York City

TAPES • RULES • PRECISION TOOLS

ROADS (Bids Asked, Cont'd.)

Bids Asked September 30

†**Neb., Bellevue**—City, F. H. Freeman, mayor, concrete curbs, gutter, sidewalks, $140,000. **FWA.** Henningson Eng. Co., Standard Oil Bldg., Omaha, engrs.

Bids Asked

Pennsylvania—State Dpt. Properties and Supplies, A. J. Warlow, ch. engr., Harrisburg, concrete roadway and coal handling equip., coal storage bins, hopper and misc. coal handling equip. Allegheny Co. Chester Engineers, 210 E. Parkway, N.S. Pittsburgh, engrs.

Bids Asked September 30

New York—State Dpt. P. Wks., Div. Hys., Albany, C. H. Sells, supt., imprv. 0.58 mi. hy. Albany Co.; sheet asphalt paving 0.9 mi. Bronx Co.; cinder surfacing, bridging, 1.07 mi. Rockland Co. Plans deposit $5 each: adv. ENR 9/23.

Bids Asked October 1

Missouri—State Hy. Comn., Jefferson City, gravel or crushed stone surfacing 4.393 mi. Bland-Owensville Rd., Route 28, Sect 21 A; 3.637 mi. same road, Route 28, Sect. 20 D, both Gasconade Co.; grading, culverts, gravel surfacing 0.123 mi. Mexico-Northeast Rd., Route 8J, Proj. PAS 759 C1, Audrain Co. C. W. Brown, Jefferson City, engr.

Pennsylvania—At office of J. U. Shroyer, secy. Dpt. Hys., Harrisburg, bituminous surface course, resurfacing 5,260 ft., Route Legislative R-57, Sect. 7, Legislative R-402, Sect. 3, Traffic R-322, Clearfield Co.; 23,328 ft., Route Legislative R-200, Sect. 1-R, Traffic R-77, Crawford Co.; 22,768 ft. Route Legislative R-99, Spur, Sect. 3, Traffic R-255, Elk Co.; 24,894 ft., Route Legislative R-84, Sect. 3-R, Traffic R-97, 15,131 ft., Route Legislative R-87, Sect. 2-R, Traffic R-20, both Erie Co.; 16,902 ft., Route Legislative R-3315, Sect. 1-R, Legislative R-79, Sect. 1-R, Legislative R-37041, Sect. 1-R, Traffic Routes 88 and 422, Lawrence Co.; 7,916 ft., Route Legislative R-97, Sect. 6, Legislative R-756, Sect. 2, Legislative R-42011, Sect. 1 Traffic Routes 219 and 46, McKean Co.; 3,634 ft., Route Legislative R-103, Sect. 5, Traffic 4-49, Tioga Co.; with bituminous and crushed aggregate base, bituminous on concrete base, also widening existing pavement with crushed aggregate base and resurfacing with bituminous surfacing 17,807 ft. Route Legislative R-170, Sect. 171A, Traffic R-309, Luzerne Co.

Ohio—State Hy. Dpt., Columbus, grading, drainage structures, widening and asphaltic concrete resurfacing 4.307 mi. Sects. A-1, A-2 and Payne of SH 422 and Sect. Antwerp of SH 422, US 24, Paulding Co., $97,500; drainage, asphaltic concrete reconstruction and roadside imprv., 6.566 mi. Sects. A, B, C, D and E of Co. Hys. 82 and 211, Portage Co.; grading, drainage structures and concrete paving 0.577 mi. Sect. A of SH 987, US 25, Hamilton Co.; grading, extend. existing structure, concrete widening existing pavement and roadside imprv. 1.181 mi. Sect. Wellston of SH 396, Jackson Co.; furnishing, placing crusher run aggregate 33.15 mi. sections SH Nos. 401, 405, 669 and 819, Gallia Co., $8,550; applying aggregate treatment 44.628 mi. sections of SH Nos. 630, 702, 793, 794, 847 and 939, Athens, Meigs and Vinton Counties, $20,700; bituminous treatment 3.08 mi. Sect. P of SH 1, US 40, Montgomery Co., $8,105; asphaltic concrete resurfacing 0.528 mi. Sect. Lucas of SH 145, Richland Co., $7,470; 0.475 mi. Sect. Delaware of SH 282, 336 and 742, US 42 and 36, Delaware Co.; 2.03 mi. Sect. G of SH 347 and Sect. F of SH 347, Licking Co., $23,800; 1.39 mi. Sect. Toledo and Rossford of SH 53, US 23 and 68, Lucas and Wood Counties; 2.263 mi. Sect. Coshocton of SH 407, US 36 and SH 477, Coshocton Co.; 0.282 mi. Sect. Millersburg of SH 241, US 62, Holmes Co.; grading, drainage structures, asphaltic concrete paving 1.647 mi., constructing continuous steel beam bridge with concrete deck and substructure over Mosquito Creek and roadside imprv., Trumbull Co.; 0.0415 mi. reworking, conditioning existing west truss span, dismantling structural steel truss span No. 3 of Waterville bridge over Auglaize River, incl. hauling, modifying and reerecting on Sect. G of SH 435, US 224, Putnam Co.

Washington—State Hy. Dpt., Olympia, ballasting and surfacing, etc., 2.74 mi. Primary State Hy. 1, Salmon Creek to Kozy Kamp, Clark Co.; clearing, surfacing, etc., 0.84 mi. primary State Hy. 9, Porter east, Grays Harbor Co.; mfg., stockpiling crushed stone surfacing, sand and mineral aggregate on Primary State Hy. 2, Snoqualmie Pass to Easton, Kittitas Co.; on Primary State Hy. 22, Fort Spokane to Fruitland, Spokane Co. Plans deposit $2. B. Bantz, state hy. dir.

Bids Asked October 6

California—State Div. Hys., Sacramento, grading, plant mix on crusher run surfacing 0.4 mi. Harbor St. in and adjacent to Pittsburg Dist. 4, Contra Costa Co. G. T. McCoy, state hy. engr.

Kansas—State Hy. Dpt., El Dorado, resurfacing material 10 mi. Proj. 5617; 19.01 mi. Proj. 5618, both Butler Co.; 12.07 mi. Proj. 5619, Harper Co.; 10.2 mi. Proj. 5620, Harvey Co.; 21.274 mi. Proj. 5621 A. B, Sedgwick Co.

Bids Asked October 7

California—State Div. Hys., State Bldg., Los Angeles, plant mix material on untreated rock base 0.5 mi. hy. between ¼ mile north of Nauman and Huenme Rds., Ventura Co., G. T. McCoy, Pub. Wks. Bldg., Sacramento, state hy. engr.

Quick Steel

● Your nearby Ryerson plant carries ready ing bars, structurals, roofing....and practi every form of steel and allied constru products....in stock for immediate ship

● The demands of the war program ha pleted our stocks in many lines, but w still able to help in many building req ments. The Ryerson Contractors and Bu Division offers a *complete* service for plan and working out your jobs. Shipments of bent and tagged steels are scheduled to your actual day-to-day needs. All constru accessories such as; wire mesh, caisson and removable forms..., etc., are shown in our Stock List. Write your Joseph T. Ryerson & Son plant in Chicago, Milwaukee, Cincinnati, St • Louis, Cleveland, Detroit, Buffalo, Boston, Philadelphia, Jersey City

RYERSON

GRIFFIN

GRIFFIN

WELLPOINT SYSTEMS

JETTING PUMPS

FOR SALE RENT

Prompt Shipments

Send for our New 60 page illustrated catalog

"GRIFFIN POINTED WELLPOINT FACTS" chock full of latest information on Wellpoint Systems for dewatering, emergency and permanent water supply systems, also information on pressure pumps and data for jetting.

GRIFFIN WELLPOINT CORP

661 EAST 161st ST. • NEW YORK

Phone: Mitrose 5-7700

(Bids Asked, Cont'd.)

Bids Asked October 8

...nesota—State Hy. Dpt., St. Paul, gravel-...600 cu. yd. SP 1506-06 (TH 92-169) be-...Bagley and 10 mi. south, O. L. Kibb, St. ...ch. engr.

Bids Asked

...ifornia—Pub. Roads Admin., 720 Phelan ...San Francisco, rejected bids Sept. 2, ...(.433 mi. El Dorado Co. CD 9/8—...9/16, under LB.

...ho—State Hy. Dpt. P. Wks., Boise, re-...d bids July 30, roadbed and drainage ...tures 16.049 mi. Valley Co. CD 8/5—...8/12 under LB.

...nois—Dpt. Pub. Wks., Div. Hys., Spring-...received no bids Sept 17, 0.56 mi. grading, ...reduction and repair of slides on ap-...ches to C.C.C. and St. Louis R. R. over-...bridge, FA Route 132, Madison Co. CD ...

...Fort Dodge—Bd. Supervs. Webster Co., ...ved no bids Sept. 8, gravel surfacing ...cu. yd. various secondary roads. J. C. ...co. engr. CD 9/3.

BIDDERS

...lifornia—U. S. Eng., 751 Figueroa St., ...Angeles 14, Sept. 11, tank roads, No. 184, ...Fredrickson & Watson Constr. Co., ...1 Ave., Oakland. $70,000-$80,000.

...lifornia—State Hy. Div., Sacramento, ...15, grading, concrete paving 4.3 mi. ...Co., from J. A. Casson Co., 22105 Meek-...Ave., Hayward, and N. M. Ball Sons, Box ...Hayward, $410,196. CD 9/7.

...rgia—State Hy. Dpt., Atlanta, Sept. 10, ...2.596 mi. Riggins Mill Rd., Bibb Co., ...R. A. Bowen, Macon, $89,440; widening, ...facing 13.362 mi. Newman-Atlanta Rd., ...ta Co., from Scott Constr. Co., Thomas-...$119,560.

...nois—Dpt. Pub. Wks. & Bldgs., Div. ...Springfield, Sept. 2, grading, concrete ...g, etc. 14,663 sq.yd. 22nd St., Grove Ave. ...Bway., in North Chicago, Sect. 35W, ...NR Proj. 9A(1), Lake Co., from Erie ...nder Constr. Co., Libertyville, $57,421.

...nois—Dpt. P. Wks. and Bldgs., Div. Hys., ...gfield, Sept. 10, 22 ft. gravel or crushed ...base and bituminous surfacing 5.56 ...Route 109 from Pere Marquette State ...southeast to Grafton, Jersey Co., from ...a Petroleum Co., 2358 S. Canal St., Chi-...$90,225.

...iana—State Hy. Comn., Indianapolis, ...16, from R. M. Bowen Co., 4430 Car-...n Ave., Indianapolis, imprv. 0.545 mi. ...son Co., $30,964, est. $59,734***from ...hern Indiana Constr. Co., Crown Point. ...mi. Lake Co., $55,269, est. $78,095; 6.272 ...Lake Co., $50,794, est. $87,342; 9.719 mi. ...r Co., $51,177, est. $72,614***from Wm. ...ogel, 3740 E. St. Clair St., Indianapolis, ...mi. Jackson Co., $25,055, est. $26,965*** ...J. C. O'Connor & Sons, Inc., 2104 Miner ...Fort Wayne, 1.304 mi. Lake Co., ...27, est. $31,952***from Bontrager Constr. ...518 W. Indiana Ave., Elkhart, 1.344 mi. ...art Co., $97,828. Est. $121,651. Received ...ids Sept. 14, imprv. 2.092 mi. Madison ...CD 9/3—ENR 9/9.

...iana—State Hy. Comn., Indianapolis, ...14, imprv. 21.34 mi. Vanderburgh and ...n Counties, from Martz & Orue, Inc., ...gham, Ill., $68,504***7.98 mi. La Porte ...from Reith, Riley Constr. Co., 618 In-...Ave., Goshen, $55,469***23.17 mi. ...on, Hancock and Madison Counties, and ...mi. Vigo and Parke Counties, from ...y Bros. Constr. Co., 2702 Barnes Ave., ...napolis, $62,024 and $62,571 respectively ...01 mi. Whitley and Allen Counties, ...Moellering Constr. Co., 241 Murray St., ...Wayne, $44,143, est. $49,966. CD 8/30—...9/3.

...aryland—Pub. Roads Admin., 1440 Co-...ia Pike, Arlington, Va., Sept. 16, Project ...military hy., D of C to Camp Springs, ...e Georges Co., from E. W. Grannis, ...ttsville, N. C., $494,345. CD 9/13.

...aryland—State Rd. Comn., 108 E. Lexing-...t., Baltimore, Sept. 14, grading, drainage, ...l surfacing 3.13 mi. along Solomons ...d Rd., Contr. 6164-1-566, Calvert Co., ...J. Julian, Wilmington, Del., $137,510.

...chigan—State Hy. Dpt., Lansing, Sept. 8, ...v. 3.76 mi., U. S. 112 through Quincy, ...C. G. Bridges, Escamaba, $169,405*** ...mi. U. S. 12 in Coldwater, from James A. ...ay and Sons, Inc., Van Dyke, $35,744*** ...mi. access road, in Bay City and 1.77 mi. ...e road, Wayne Co., from The Bridgeport ...Sand Co., Saginaw, $70,029 and $108,082 ...ctively. CD 9/14—ENR 9/16.

...rth Carolina—State Hy. Dpt. & Pub. ...Comr., Raleigh, Sept. 14, traffic bound ...dam base widening and sand asphalt ...cing 9.35 mi. Perquimans Co., from R. B. ...Co., Inc., Monroe, N. C., and 1446 ...ring St., Louisville, Ky., $81,459. Est. ...000-$150,000.

...io—State Hy. Dpt., Columbus, Sept. 14, ...v. 9.963 mi. Auglaize Co., from Churchill ...r. Co., 1126 State St., Lima, $30,748. ...$30,000. CD 9/7—ENR 9/9.

...L. Middletown—Town, P. Wks. Dpt., ...Hall, Sept. 17, paving, widening, drain-...Chase Lane, Maple and Beacon Sts., ...47-140, from Dwyer Bros., Inc., and ...Fanning Constr. Co., Inc., R.F.D., ...port, $67,533. FWA. CD 9/10—ENR 9/9.

When Johnny comes marching home . . .

. . . and GABRIEL sounds his horn. VIBERATING to every nook and crevice of this troubled globe with the COMMAND . . . CEASE FIRING! Then the white dove of PEACE will signal to the armed forces that it's all over, ADOLF and his crackpot stooges will be cast into the inferno and then this old world of ours will launch the GREATEST PERIOD OF RECONSTRUCTION we have ever experienced . . . but it will be improved permanent construction, built of CONCRETE for POSTERITY of course. We'll all get the GREEN LIGHT to GO!

Competition will be keen

and the successful bidder on any specific job will be the one who has prepared himself by a careful study of the newest methods and EQUIPMENT which will insure a speedy, competent and profitable completion of the contract.

Prepare NOW for the competition and opportunities of the postwar improvement and modernization program.

Keep Ahead of Schedule with Viber "Viberation"

- Vibrating SPEED in concrete over 9500 r.p.m.
- HIGH SPEED . . . LOW AMPLITUDE
- 3 Kinds of POWER: Electric, Pneumatic and Gasoline.

Vibrator Head made in 3", 2½" and the new 1¾" Diameter for especially thin walls.

All sizes of vibrator heads are interchangeable.

- The handy PORTABILITY of a VIBER makes it easy to move along on the job.

For the Newest in Vibration Get set with . . .

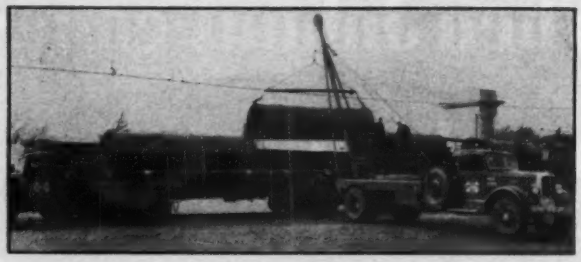
VIBER

Originators of Internal Concrete "VIBERATION"

726 South Flower Street
BURBANK, CALIFORNIA

WRITE FOR VIBER CATALOG TODAY

WHEN THE FIGHTING GUNS ARE STILLED



WILL YOU BE READY TO GO AHEAD?

Improvements large and small will be necessary in many American cities and towns at war's end. Forward looking municipal and utility officials are making specific plans now so that needed improvements can be started promptly. Mono-Cast Centrifugal Pipe, manufactured according to the new A.S.A. Law of Design, is a pipe adapted to a variety of severe requirements—a pipe highly esteemed by those who want lasting performance at the lowest cost per service-year. Sizes 3" to 48" inclusive.

Prompt Shipments NOW, under appropriate priority rating

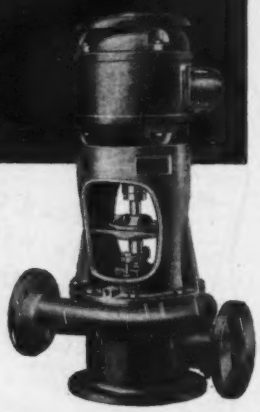
AMERICAN CAST IRON PIPE COMPANY

BIRMINGHAM 2, ALABAMA

Sales Offices in Principal Cities

The Pump

DESIGNED AND BUILT TO MEET TODAY'S DEMANDS



The new Economy SCV pump is adaptable to almost any pumping job where clear water or liquids are handled. Vertical in design—it saves space and places motor high and dry above its mounting surface. It is built with the stamina to do the job—no costly pump failures to disrupt schedules. For services from 10 to 500 G.P.M. with heads up to 225 Feet. Write for Catalog D2-1042 which fully describes and illustrates the SCV pump.

Free!

Economy's latest Pump Data Book. Contains a wealth of data and supplies information for the solution of most pumping problems. Written in simplified form—easily understood by anyone interested in pumps. Get your copy now—simply send your request on company's letterhead.

- Easy to install—low operating cost — minimum maintenance requirements.
- Complete rotor, including motor, can be removed without disturbing the suction and discharge connections.
- No costly shutdowns — in the event of motor failure any comparable stock motor is easily adapted.
- Impeller runs smoothly between two bearings—no shaft whip—no noise.

Economy Pumps Inc.

HAMILTON, OHIO

ROADS (Low Bidders, Cont'd.)

†South Carolina—U. S. Eng., North Charleston, Aug. 28, concrete paving, dock ... storage area, No. 231-44-34-Neg., Charleston Co., from C. Y. Thomason Co., Greenwood, under **$50,000.**

Texas—State Hy. Comm., Austin, Sept. ... impry. 2.404 mi. Parker ... from A. L. ... 804 Ave. I, Brownwood. **$26,362*****4.261 ... Liberty and Chambers Counties, from ... Bros., Madisonville, **$47,185*****7.568 mi. ... ferson Co., from Harrison Engrs. & ... Co., 4628 Mill Creek Pkwy., Kansas City, ... **$213,967*****1.214 mi. Orange Co., from ... Cohen, 206 Dunn Bldg., Marshall, ... 3.671 mi. Calhoun Co., from Holland ... P. O. Box 971, Austin, **$83,937*****1.617 ... Brazoria Co., from L. H. Lacy Co., ... Henderson St., Dallas, **$82,186.** Cancel ... bids to have been opened 9/14, impry. ... mi. Cameron Co. CD 9/7.

†Virginia—Pub. Roads Admin., at office H. ... Spelman, dist. engr., 1440 Columbia ... Arlington, Sept. 15, access road, Proj. VA ... WR 21, Paving 51, Henry G. Shirley Memorial Hy., Arlington and Fairfax Counties, ... Corson & Gruman, 33 and K Sts. N.W., Wash., D. C., **$240,485. FWA.** CD 8/31—ENR 9/2.

Wisconsin—State Hy. Comm., Madison, Sept. 17, impry. Elroy-Wilton Rd., ... Trunk Hy. 71, Monroe Co., from A. ... gaard, Cambridge. **$70,005*****Wilton-Spar ... Rd., State Trunk Hy. 71, Monroe Co., ... Ed. Muller, LaFarge. **$57,596*****State Trunk ... Hy. 55, Outagamie Co., from Koepke Sand ... Gravel Co., Appleton, **$55,860.** CD ... ENR 9/9.

CONTRACTS AWARDED

★**California**—State Div. Hys., Sacramento, ... surfaced area and an access road there ... near Honey Lake, Lassen Co., to Radich ... Brown, 111 San Leandro Blvd., San Leandro, **$521,901.** CD 8/31—ENR 9/2, under LB.

California—State Div. Hys., Sacramento, ... impry. 6.8 mi. Calaveras Co., to A. Teich ... & Co., Box 1113, Sacramento, **$24,580.** ... 9/8. CD 9/14—ENR 9/16.

†Florida—U. S. Eng., 575 Riverside Ave., ... Jacksonville, Zone 2, widening, resurfac ... N. W. 72 Ave., constructing bridge and gra ... ing shoulders, Neg-Jax-44-173, Dade Co., ... W. T. Price Dredging Co., 3200 S. W. 27 ... Miami, Zone 33, approx. **$70,000.** Award ... 8/31.

†Georgia—U. S. Eng., Post Office Bldg., ... Savannah, paving. Contr. 819-eng-6004, Col ... Co., to Sam Finley, Inc., 292 North Av ... N.W., Atlanta. **$100,000.**

†Georgia—U. S. Eng., Post Office Bldg., ... Savannah, grading, paving, Liberty Co., ... Espy Paving & Constr. Co., 108 E. Bay St., ... Savannah, about **$25,000.**

Illinois—Dpt. Pub. Wks. & Bldgs., Div. ... Hys., Springfield, impry. 4.65 mi. Montgomery ... Co., to Joyce Bros. Constr. Co., Springfield, **$343,708.** Bids 7/23. CD 7/28—ENR ... under LB.

†Ind., Crane (mail Stockwell)—Yards & ... Docks, Navy Dpt., 18 St. and Constitution Ave., ... N.W., Wash., D. C., clearing, grading, surfacing, etc., Naval Ammunition Depot, NOY 66 ... to Ralph Rogers & Co., Bloomington, **$341,** **(Correction**—location and type of work. ... 9/14—ENR 9/16 under Indiana, Unclassified **CA.**

Kansas—State Hy. Dpt., Topeka, grading and light type surfacing 3.327 mi. DA-WR-1 ... to Miller-Clarkson, Dodge City, **$60,** ... Bids 9/14, awarded 9/15. CD 9/8.

†Kentucky—U. S. Eng., 612 Federal Bldg., ... Louisville, road. Contr. No. 15-029-Eng-4 ... Hardin Co., to Middle West Roads Co., ... Noblesville, Ind., **$100,000.**

†Maine—U. S. Eng., 31 St. James Ave., ... Boston, Mass., paving, No. 19-028-44-Neg-3 ... Aroostook Co., to Wyman & Simpson, Inc., ... 283 Water St., Augusta. Est. under **$50,** ... Bids 8/30. CD 8/26.

†Massachusetts—U. S. Eng., 31 St. James ... Ave., Boston, roads, utilities. Contr. 19-028-eng-44, Barnstable Co., to B. Perini & Sons, Inc., ... Montwait Ave., Framingham. **$200,000.**

Mississippi—State Hy. Comm., Jackson, grading, drainage structures and alternate type ... double bituminous surface treatment 6.686 mi. ... of access road, Hinds Co., to E. W. Hable & ... Sons, Corsicana, Tex., **$44,503.** Bids 9/7, ... awarded 9/16. F. A. Monette, Jackson, acting ... ch. engr.

†New Jersey—U. S. Steel Corp., 71 Broadway, ... New York, roads, grading, paving. Essex Co., ... to Universal Const. Co., 6 Avenue B, Newark, **$50,000.** Federally financed.

†New York—U. S. Eng., Chimes Bldg., Syracuse, roads, walks, parking areas, Contr. 12-eng-993, Oneida Co., to Peckham Road Corp., ... 47 Mamaroneck Ave., White Plains, **$60,000.**

†North Carolina—U. S. Eng., 308 Custom ... house, Wilmington, paving, drainage, Contr. ... 982-eng-1939 Carteret Co., to F. D. Clin ... Fairview Rd., Raleigh, **$300,000.**

Ohio—State Hy. Dpt., Columbus, impry. ... 0.452 mi. Richland Co., to J. C. O'Connor ... Sons, Inc., 2104 Miner St., Fort Wayne, Ind., ... **$28,832,** est. **$29,100*****1.672 mi. Fulton Co., ... to S. E. Johnson Co., 218 Terminal Bldg., ... Toledo, Zone 2, **$38,541,** est. $40,400***1.4 ... mi. Ottawa Co., to V. N. Holderman, 257 ... High St., Columbus, **$50,600,** est. $51,800

...DS (Contracts Awarded, Cont'd.)

...mi. Scioto Co., to Frowine Constr. Corp., ... Prospect St., Portsmouth, **$25,400**, est. ...****2.982 mi. Williams Co., to The A. W. ... Constr. Co., 424 Woodland Ave., Columbus, **$47,196**, est. $47,840***4.21 mi. Fairfield ... to F. H. Brewer, P. O. Box 40, Lancaster, **$56,100**. Grand total $246,668. ... est. Received no bids Sept. 14, imprv. 9/14. ... mi. Guernsey Co. CD 9/7—ENR 9/9.

...ia., Durant—Yards & Docks, Navy Dpt., ... and Constitution Ave. N.W., Wash., ... roadways and utility services, A' A F. ... 7978, to Industrial Constr. Co., 1025 NE ... Oklahoma City, **$94,896**.

...nsylvania—U. S. Eng., 925 New Federal ... Pittsburgh, blacktop resurfacing 12.4 ... Crawford Co., to Baldwin Bros., Union ...merce Bldg., Cleveland, O. Est. **$100,000**-... Fraser-Brace Engr. Co. Inc., 10 E. 40 ... New York, N. Y., and Meadville, Pa., engrs.

...s., Velasco—P. B. Barten, mayor, asphalt ... paving, to Brown & Root, Inc., Box 3, ... **$81,809**.

...Washington—U. S. Eng., 800 3 Ave., ...tle, Zone 4, surfacing, Grant Co., to ...sworth & Co., and Macdonald Bldg. Co., ...e Lake, **$70,000**.

...a., Edmonton—Paving 115 Ave., to Crown ...tr. Co. Ltd., Edmonton, **$30,442**.

...bec—Dpt. Rds., Quebec City, preliminary ... and graveling on 5 mi. Hy. 3, between ...ry and Beaubarnois, to Kennedy Constr. ... Ltd., 485 McGill St., Montreal, approx. ...000. CD 8/24.

...bec—Province of Quebec, Quebec City, ...ling Compton Co., to Marchessault & ... Ltd., 10 W. St. James St., Montreal, **$28,**-... reconstructing bridges, approaches on ... Stanstead Co., to National Paving & ...tr. Co. Ltd. 934 E. Ste. Catherine St., ...treal, est. **$25,000**; 5 mi. bituminous con-... pavement and 1,000 ft. wooden ditch. ...ce Co., to L. Boucher, St. Georges de ...ce, **$38,810**; constructing 5 mi. hy., Mont-...ney Co., to Union des Carrieres et Pavages ... 48 Second Ave., Quebec City, **$34,604**. ...d total **$411,561**. E. Gohier, Dpt. Roads, ...bec City, engrs.

...e., Arvida—Aluminum Co. of Canada Ltd., ... Life Bldg., Montreal, 6 mi. concrete pav-...100,000 sq. ft. area, day labor, **$32,000**. CD ...

EARTHWORK, WATERWAYS

POSED WORK

...alifornia—U. S. Maritime Comn., Finan-... Center Bldg., Oakland, dredging for finger ... Yard 2.

...b., Grand Island—Hall Co., flood con-... construction. $15,000.

...ennsylvania—U. S. Eng., 925 New Federal ..., Pittsburgh, 1 or more navigation locks ... dams to replace existing units in Ohio ..., below Montgomery Locks, Allegheny ... Over **$15,000**.

...exas—U. S. Eng., 25 St. and Avenue F. ...ston, riprap paving at Barker Dam, Sol. ...4-C37.

...Washington—U. S. Eng., 800 3 Ave., Seattle, ... 4, draining, fencing, Neg. 732, Pierce Co.

...t., Toronto—F. J. Conboy, mayor, rein.-... seawall on Ward's Island. R. C. Harris, ... Hall, comr. of Wks. and engr.

...e., Montreal—J. A. Mongeau, city clk., ...ing Raimbauet Creek. $50,000.

...e., St. Joseph de Beauce—Province of ...ec, Quebec City, canalization of the ...dlere River. $100,000. Dpt. P. Wks., ...ec City, engrs.

S ASKED

Bids Asked September 28

...isiana—Bd. Comrs. Caddo Levee Dist. ... Red River-Bayou Pier Levee and Drainage ..., Courthouse Bldg., Shreveport, imprv., ...tructing Prairie River in Caddo and Red ... Parishes.

Bids Asked September 29

...rkansas—U. S. Eng., U. S. Post Office and ...thouse, Vicksburg, Miss., repairing, exten. ... Bluff Bank protection, on south bank of ...nsas River, incl. all grading, drainage ... excav., mattress weaving, and sinking. ...g. etc., No. 22-52-44-22, at Pine Bluff, ...rson Co.

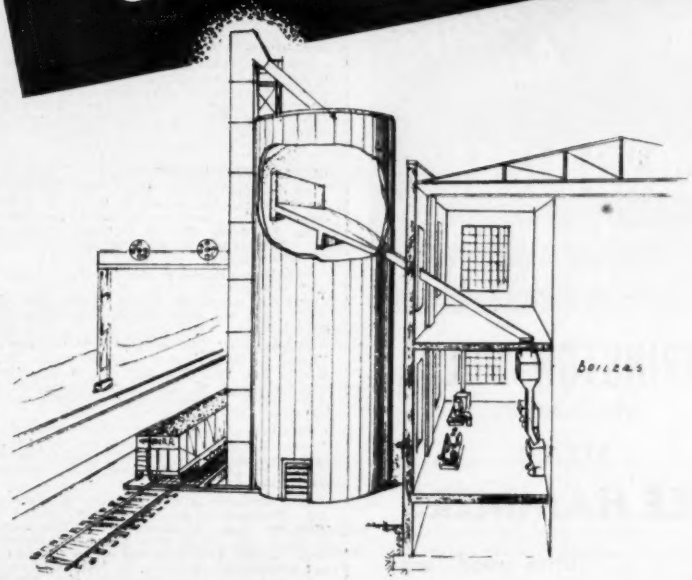
Bids Asked October 5

...n., Warren—L. G. Johnson, aud. Mar-... Co., Warren, cleaning, repairing Judi-...Ditch 16, 39, 804 cu. yd. excav., etc.; Judi-...ditch 18, about 103,402 cu. yd. excav. etc. ...00. H. T. Swanson, Warren, engr.

Bids Asked October 11

...olorado—Bureau of Reclamation, Custom-..., Denver, constructing Shadow Mountain ... and dikes. Colorado-Big Thompson proj-...pec. 1059.

CONVERTING from OIL to COAL ?



We can offer Speedy Design

. . . QUICK CONSTRUCTION

Conversion jobs are "right down our alley" because they are fundamentally jobs involving the storage and handling of bulk materials with which we have had years of experience. We've put in hundreds of coal-handling facilities for power plants.

Modern methods for handling coal results in clean, dustless boiler rooms. Coal can be made to flow much as a liquid. You need have "no aversion to conversion."

Our engineers and construction crews are fully qualified to study your boiler plant layout, to draw up detailed plans for converting from oil to coal and then to go ahead with a speedy, workmanlike job. Preliminary discussion of your conversion problem will entail no obligation.

TYPICAL NICHOLSON COAL-HANDLING LAYOUT ILLUSTRATED ABOVE

Coal flows from cars through hopper to elevator, carried up to live storage shelf "A" feeding direct to scale, weighlarry, stoker or pulverizer. Overflow from shelf "A" goes to reserve storage "B" where it can be reclaimed by same elevator.

BULK STORAGE · COAL-GRAIN-LIQUIDS STORAGE · HANDLING EQUIPMENT

THE NICHOLSON CO.

CONSTRUCTION · CEMENT-OIL-CHEMICALS

TEN ROCKEFELLER PLAZA, NEW YORK, 20, N. Y.

RUGGED STRENGTH
SIMPLE DESIGN
Easy Operation
Positive Action
ECONOMICAL
—to operate
—to maintain

WARRINGTON-VULCAN
SINGLE-ACTING
STEAM
PILE HAMMERS

Drive wood, concrete, or steel piles this low-cost, dependable way. For almost 57 years the Warrington-Vulcan has been demonstrating its great ability and many important jobs in the United States and other countries. It operates at a medium steam pressure and delivers a moderate frequency of low velocity blows from a relatively heavy ram. Free from mechanical troubles, you are assured of regular and continuous action. Write for complete details.

VULCAN IRON WORKS
Since 1832
331 North Bell Avenue
Chicago Illinois

EARTHWORK, etc. (Cont'd.)

Bids Asked October 13

†Washington—Bureau of Reclamation, Yakima, earthwork, concrete lining, structures, from Station 3354-00 to Station 4713-00, Yakima Ridge Canal, Roza Div., Yakima Project, about 4 mi. northeast to about 15 mi. east of Sunnyside, Spec. 1060.

LOW BIDDERS

New York—Comr. Parks, at office Dpt. Parks, Arsenal Bldg., Central Park, 5 Ave. and 64 St., New York, Sept. 15, dredging basin for unloading plant, Great Kills Harbor, Richmond Co., from Arundel Corp., foot of Fulton St., Brooklyn, $155,120. CD 9/7—ENR 9/9.

†Pennsylvania—W. R. Hodder, Sherman St., New Castle, project mgr. United Engineering & Foundry Co., Sherman St., New Castle, Sept. 7, relocation and incidental work, Neshannock Creek Channel change, incl. channel widening, storm and sanitary sewer work, railroad trackage relocation, 2 new railroad bridges, etc., for Defense Plant Corp., from F. H. McGraw Co., 1st Natl. Bank Bldg., Pittsburgh. Est. $100,000-$500,000. CD 8/24—ENR 8/26.

†Washington—Bureau Reclamation, Yakima, Sept. 15, earthwork, pipe lines, structures, laterals, sublaterals diversion channels on Roza Div. of Yakima Project, near Yakima, Spec. 1057, from Murphy-Campbell Co., c/o McCollister & Campbell, Central Bldg., Seattle, Zone 4. $71,574. CD 8/24—ENR 8/26.

CONTRACTS AWARDED

†Arkansas—U. S. Eng., 300 Bway., Little Rock., repairing levees in Dists. 1, 2, 6 and 8, Conway Co., and in McLean Bottom Levee Dist. 3, Logan Co., to Ottinger Bros. Constr. Co., Petroleum Bldg., Oklahoma City, Okla., $60,000 ea.

†Florida—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., dredging, seaplane ramp, NAF, Dinner Key, NOY 6524, to Reed Constr. Co., Miami Beach. $111,177.

†Kansas—U. S. Eng., 416 Wright Bldg., Tulsa, 2, Okla., levee embankment, Verdigris River, Sol. Ser. No. 957-neg-44-25, Montgomery Co., to A. C. Sherwood Const. Co., 829 N. Penn Ave., Independence, $28,000. Bids 8/21. CD 8/6.

†Kansas—U. S. Eng., 416 Wright Bldg., Tulsa, 2, Okla., levee repairs, 26,000 cu. yd. levee embankment, Sol. 957-neg-44-39, Neosho Co., to R. Ade, 340 W. Jewell St., Salina, $44,000. Bids 8/25.

New Jersey—F. D. Holmes, dir.-secy. State Bd. Commerce & Navigation, State House, Trenton, Zone 7, stone jetty, Delaware Bay, Project 190, Cape May Co. and timber bulkhead timber pile crib and stone toe wall, Project 191, Monmouth Co., to Thomas Proctor Co. Inc., 218 N. 5 Ave., Long Branch, $60,386 and $119,944 respectively. Bids 9/8. CD 8/18—ENR 8/26.

★**†New York**—U. S. Eng., 120 Wall St., New York, Zone 5, dredging deep strip through middle of Ambrose Channel, New York Co., own forces. $1,200,000.

†Oklahoma—U. S. Eng., 416 Wright Bldg., Tulsa, Zone 2, 1st sect. Arkansas River levee, from Sand Springs to Blackboy Creek, Tulsa Co., to Ottinger Bros., Petroleum Bldg., Oklahoma City, $406,108. Bids 9/14. CD 9/7.

UNCLASSIFIED

PROPOSED WORK

Colo., Englewood—SWIMMING POOL, etc. —City Council bids soon swimming pool, park, $75,000.

★**Indiana**—RAILROAD IMPROVEMENTS—Pennsylvania R. R., J. L. Gressitt, ch. engr., Broad St. Sta., Phila., Pa., addnl. railroad imprvs., incl. 10 mi. double-track main line to replace single track, new eastward passing siding, exten. 2 westward and one eastward passing sidings, bridge and signal work, reduction of grade east of Greenfield, $825,000; 2 relay tracks, 150 car cap. each, with adjacent running tracks, coal and water facilities, Hawthorne yard (Indianapolis), $192,000; exten. eastward siding, Ben Davis, to Kraft cooling sta., exten. westward siding, $227,500; new sidings at Clayton, Ind., Dublin, Dunreith and Centerville, track extens., $608,000. Total est. approx. $2,000,000.

†Louisiana—IMPROVEMENTS—U. S. Eng., 300 Bway., Little Rock, Ark., imprvs., bldgs., Sol. 777-44-39, Caddo Parish. Over $25,000.

Louisiana—OIL WELL—Humble Oil & Refining Co., Humble Bldg., Houston, Tex., 12,000 ft. test oil well, fuel line, earthen storage, Iberville Parish. $25,000.

La., Ruston—SWIMMING POOL—Louisiana Polytechnic Institute, plans by Neild, Somdal & Neild, City Bank Bldg., Shreveport, swimming pool. $100,000. CD 9/13—ENR 9/16.

†Massachusetts—GRADING, etc.—U. S. Eng., 31 St. James Ave., Boston, will not grade, construct gravel walks, plant, No. 19-023-44-Neg 49, Plymouth Co. Project cancelled. CD 9/10—ENR 9/16.

†Maine—GRADING, etc.—U. S. Eng., 31 St. James Ave., Boston, Mass., soon lets contract, grading, planting, No. 19-023-44-Neg 55. Under $55,000.

★**†Montana**—TRANSMISSION LINES—Bureau of Reclamation, Customhouse, Denver, Colo., electric power transmission lines (eventually to be 500 mi. network of lines radiating from Fort Peck Dam). Total est. over $[illegible],000,000.

Nebraska and Iowa—NATURAL GAS PIPE LINE—Northern Natural Gas Co., Aquila Court, Omaha, Neb., natural gas pipeline to Council Bluffs, Ia. to Omaha, Neb., and Missouri River. Approx. $25,000.

†New Mexico—IMPROVEMENTS—U. S. Eng., 4 and Gold Sts., Albuquerque, imprvs., concrete paving 15,000 sq. yd. Albu-M-36, Kinley Co. Over $25,000.

†Texas—ELECTRIC LIGHTING SYSTEM—U. S. Eng., Fort Sam Houston, electric lighting sys., incl. outside distr. sys., Bexar Co. $100,000.

†Texas—IMPROVEMENTS—U. S. Eng., Wright Bldg., Tulsa, Okla., imprvs., access driveway, Sol. 957-Neg-44-67, Gray Co. Over $25,000.

†Texas—IMPROVEMENTS—U. S. Eng., Fort Sam Houston, addnl. construction improvements, incl. bldgs., water, sewer, gas lines etc., Bexar Co.

†Texas—RADIO TRANSMISSION BUILDING, FACILITIES, etc.—U. S. Eng., 33 and Avenue F, Galveston, radio transmission bldg., facilities, etc., Matagorda Co.

Tex., Kerrville—RESORT IMPROVEMENTS—Synod of Texas, resort imprvs. incl. grounds development, water, sewer, gas lines, cottages, etc. $75,000.

Tex., Kingsville—OIL WELL—C. Stanolind et al., Kingsville, developing new 4,500 ft. oil well.

Tex., La Ward—OIL WELL—W. L. Pickens, Edna, drilling, developing new 4,800 ft. oil well. $25,000.

Tex., Memphis—OIL WELL—Stanolind Oil & Gas Co., Fair Bldg., Fort Worth, drilling, developing 6,500 ft. test oil well. $25,000.

Tex., Mertzon—OIL WELL—Humble Oil & Refining Co., Humble Bldg., Houston, 10,000 ft. deep test oil well.

Tex., Myersville—OIL WELL—Arkansas Fuel Oil Co., Esperson Bldg., Houston, drilling, casing, developing new 9,200 ft. oil well.

†Tex., Nederland—IMPROVEMENTS—Jefferson Co., Beaumont, imprvs. $75,000, Cal. Wignall & Neff, Pt. Arthur and H. Woodell, Beaumont, archts. CD 8/23—ENR 8/26.

Tex., Pasadena—PIPELINE UNITS—Cities Central Petroleum Corp., Pasadena, pipeline units in refinery and loading areas. $35,000.

Tex., Pittsburg—OIL WELL—H. S. Moss, National Bank Bldg., Dallas, drilling, casing, developing new 8,100 ft. test oil well.

Tex., Pittsburg—OIL WELL—Whitaker Co., Ltd., D. Waggoner Bldg., Ft. Worth, drilling, casing, developing new 10,000 ft. oil well.

Tex., Point Isabel—OIL WELL—Great Lakes Carbon Co. et al, Brownsville, drilling, developing 11,000 ft. oil well test.

BIDS ASKED

Alta., Netook—IMPROVEMENTS—Asst. Secy. Dpt. Transport, Ottawa, Ont., improvements, clearing, grading, drainage for Dom. Government, Ottawa, Ont. $50,000.

Bids Asked September 29

†D. C., Wash.—WIND TUNNEL—Natl. Bu. Standards, Purchase Sect., Conn. Ave. and Van Ness St. N. W., 6 foot wind tunnel.

Bids Asked after October 13

★**Mass., East Boston**—IMPROVEMENTS—Dpt. P. Wks., 100 Nashua St., Boston, imprvs., filling, dredging, $4,750,000. R. Hutchins, c/o Dpt. P. Wks., engr. CD 6/1-ENR 6/24.

†Massachusetts—IMPROVEMENTS—U. S. Eng., 31 St., James Ave., Boston, (selected list bidders), imprvs., No. 19-023-44-NEG 5[illegible] under $50,000.

†New Jersey—AIR TRAFFIC CONTROL TOWER—Curtiss-Wright Corp., Fairfield Rd., Caldwell, air traffic control tower. Federal financed. Haller Engrs. Assoc., 33 Memorial Dr., Cambridge, Mass., engrs.

LOW BIDDERS

†Conn., Windham—AIRPORT—Civil Aeronautics Admin., Box 636, LaGuardia Field, Jackson Heights, N. Y., Sept. 15, airport, incl. grading, clearing, draining, paving, fencing, utilizing and seeding, from Henley-Lundgren Inc., 524 River St., Mattapan, Mass., $[illegible] CD 9/10—ENR 9/16.

†Louisiana—CONSTRUCTION—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., Sept. 13, addnl. construction. Bolle, $[illegible] Vernon Parish, from Le Blanc Brothers & Co., Louisiana Natl. Bank Bldg., Baton Rouge, under $50,000.

Tex., Terrell—IMPROVEMENTS—Terrell Aviation School, imprvs., paving runways, taxiways, etc., from C. A. and J. W. Wilson Jr., 3825 Normandy St., Dallas, $151,210. CD 9/13.

ASSIFIED (Contracts Awarded, Cont'd.)

TRACTS AWARDED

...ifornia—GASOLINE DRUM STORAGE ...s & Docks, Navy Dpt., 18 St. and Con... ...ue N. W., Wash., D. C., addnl. ...e drum storage, NOY 7168, to Macco ..., Co., 815 Paramount Blvd., Clearwater, ...nia.

...f., El Centro — PLANE PARKING ...—Yards & Docks, Navy Dpt., 18 St. ...Constitution Ave. N.W., Wash., D. C., ...plane parking area, Spec. 12070, NOY ...to Macco Constr. Co., 815 Paramount ...Clearwater. Est. $137,900.

...f., El Toro—WARM-UP PLATFORM— ...& Docks, Navy Dpt., 18 St. and Consti... ...Ave. N. W., Wash., D. C., warm-up ...m addn., M.C.A.S., to Basich Bros. ...nd Robt. M. Price, 600 S. Fremont Ave., ...bra, $265,000.

...f., Goleta—PLANE PARKING AREA— ...& Docks, Navy Dpt., 18 St. and Con... ...on Ave. N.W., Wash., D. C., addnl. ...parking area, Spec. 12072, NOY 7218, ...acco Constr. Co., 815 Paramount Blvd., ...water. Est. $185,000.

...f., Hunters Point—STORAGE FACILI- ...—Yards & Docks, Navy Dpt., 18 St. and ...titution Ave. N. W., Wash., D. C., miscel... ...storage facilities, NOY 6494, to Mac... ...d & Kahn, Inc., 200 Financial Center ...San Francisco, $91,229.

...f., Mojave—PLANE PARKING AERA ...ds & Docks, Navy Dpt., 18 St. and ...titution Ave. N.W., Wash., D. C., addnl. ...parking area, Spec. 12071, NOY 7217, to ...L. Ferry & Son, 5200 San Fernando ...Los Angeles. Est. $105,000.

...f., San Diego—TAXIWAYS—Yards & ...Navy Dpt., 18 St. and Constitution ...N.W., Wash., D. C., taxiways parallel ...avy duty runways, Spec. 11869, NOY ...to Macco Constr. Co., 815 Paramount ...Clearwater. Est. $300,000.

...ff., San Diego—TAXIWAYS—Yards & ..., Navy Dpt., 18 St. and Constitution Ave. ..., Wash., D. C., heavy duty taxiways, ...Air Station, NOY 6992, to Macco Constr. ...815 Paramount Blvd., Clearwater, $400,-

...lif., Santa Barbara—PLANE PARKING ...—Yards & Docks, Navy Dpt., 18 St. ...Constitution Ave. N. W., Wash., D. C., ...plane parking area, M.C.A.S., NOY ...to Macco Constr. Co., 815 Paramount ...Clearwater, $179,285.

...rida—INTERIOR WORK—U. S. Eng., ...iverside Ave., Jacksonville, Zone 2, in... ...work, Neg-Jax-44-159, Dade Co., to ...I. Barnes Constr. Co., 705 Metcalf ...Orlando, $400,000. Awarded 9/15.

...rida — IMPROVEMENTS — U. S. Eng., ...Riverside Ave., Jacksonville, Zone 2, ...g, reconstructing imprva., Neg-Jax-44-... ...Co., to James H. Craggs Constr. Co., ...$300,000. Awarded 9/16.

...d., Crane (mail Stockwell)—IMPROVE- ...TS—Yards & Docks, Navy Dpt., 18 St. ...Constitution Ave. N. W., Wash., D. C., ...s, access roads, reconditioning drive- ...and traffic control road, NAD, NOY ...to Ralph Meyers Constr. Co., Box 230. ...$446,902.

...d., Crane (mail Stockwell)—TRANS- ...DEPOT DOCK, etc.—Yards & Docks, ...Dpt., 18 St. and Constitution Ave. N. W., ..., D. C., transfer depot, dock, fuse as... ...y, etc., NAD, Crane, NOY 6691, to S. S. ... Co., 307 N. Michigan Ave., Chicago, ...$97,000.

...iana—HARDSTANDINGS—U. S. Eng., ...ederal Bldg., Louisville, Ky., hardstand... ...Contr. 15-029, Eng-59, Bartholomew Co., ...rmingham Contracting Co., 208 Hanna ..., Birmingham, Mich., $100,000.

...a—IMPROVEMENTS—U. S. Eng., 1709 ...n St., Omaha, Neb., imprva., roads. ...Co., to Summit Const. Co., Rapid City, ...Est. under $50,000.

...isiana—IMPROVEMENTS—U. S. Eng., ...and Avenue F, Galveston, Tex., imprvs., ...49-44-C17, Calcasieu Parish, to A. M. ...baugh, Lake Charles, $30,000.

...isiana — LIGHTING SYSTEM — U. S. ...25 St. and Avenue F, Galveston, Tex., ...e night lighting sys., Sol. 259-44-C23, to ...Electric Co., Maison Blanche Bldg., New ...ns, $30,000.

...assachusetts—RUNWAY EXTENSIONS ...U. S. Eng., 819 Industrial Trust Bldg., ...ence, R. I., runway extens., Contr. ...ng-2486, Bristol Co., to Carlo Bianchi & ..., Inc., 24 Union Ave., Framingham, ...000.

..., Holyoke—ARENA— Homer Reinault ...640 Bridge St., rebuilding Valley Arena, ...thalt Constr. Co., Appleton St., $35,000. ...7/23—ENR 6/24.

...braska—IMPROVEMENTS—U. S. Eng., ...Jackson St., Omaha, imprvs., sedimenta... ...ank and pump house, Dawes Co., to In... ...Constr. Co., 39 and Leavenworth Sts., ...a. Est. $50,000.

...braska—IMPROVEMENTS—U. S. Eng., ...Jackson St., Omaha, imprvs., Clay Co. ...rahoj-Beckenhauer, Blair. Est. approx. ...00.

Ready for Immediate Use

HAUSMAN *Removable* **FORMS**

for Concrete Construction

• In view of relaxed restrictions on concrete structures Hausman is in a position to release from stock removable steel forms for concrete construction.

The use of Hausman Steel Forms not only enables you to speed up construction and reduce costs but saves the use of critical lumber.

Hausman warehouses at Toledo and Columbus, Ohio, can furnish from stock a wide range of regular forms. Stock items include adjustable shores, structural steel beams for stringers, wooden stringers, steel panels, forms for ribbed slabs, solid slabs, flat slabs and column moulds.

HAUSMAN

Hausman service is unique and includes designing, detailing, furnishing, erecting, stripping forms both for unusual structures and standard construction.

Hausman can make your job easier. Write, wire or phone for an appointment with a Hausman Engineer.

The HAUSMAN STEEL Company

TOLEDO OHIO

THESE DATA SHEETS WILL HELP YOU.

They give computed volume of concrete in various sizes of Circular Columns, Column Heads, Beams, Ribbed Slabs.

THE HAUSMAN STEEL COMPANY, TOLEDO, OHIO.

Please use this convenient and useful tabulation of data to save time in figuring concrete volumes.

Name .....

Company .....

Address .....

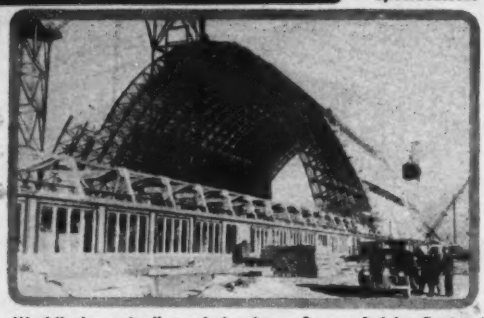
PROTEXOL

INVITES YOU TO *Write for new Circular 103 "Specifications"*

PRESSURE-TREATED

Fireproofed Wood

FIREPROOFS AND PRESERVES FOR U. S. NAVY U. S. ARMY AND WAR PLANTS



World's largest all-wood structure—fireproofed by Protexol.

Use Protexol pressure-treated fireproofed wood for structural members, scaffolding, sheathing, plywood construction, air conditioning ducts. Millions of feet in use by U. S. Government and War Production Plants. Protexol is permanent, non-corrosive. The same values assigned to corresponding untreated wood may be used in calculating loads and stresses. Costs less than steel.

Proved by 50 years of service. Protexol is labeled non-combustible by Underwriters' Laboratories, Inc. Approved by Fire Insurance Companies, U. S. Bureau of Standards. Complete chemical and engineering laboratories for test purposes available nationally. 12 plants to serve you.

Kenilworth, N. J. Montgomery, Ala. Houston, Tex. Salida, Col.
Nashua, N. H. Jacksonville, Fla. Texarkana, Tex. Portland, Ore.
Charleston, S. C. Grenada, Miss. North Little Rock, Ark. Alameda, Cal.

Write today for complete information on Protexol treatments, other installations, service records.

Write today for complete Data **ACTUAL SERVICE RECORDS**

PROTEXOL CORPORATION

Wood Preservers since 1887

26 Market Street, Kenilworth, New Jersey
16 East 43rd St., New York City • VAnderbilt 6-3495

COMMERCIAL TUNNEL LINER PLATES

FOR SAFER FASTER EASIER TUNNEL CONSTRUCTION

• The many applications for COMMERCIAL LINER PLATES are surpassed in value to you only by their ability to make tunnel construction safer, faster and easier.

Regardless of the size or shape of your next tunnel project we can supply COMMERCIAL PLATES to meet every specification.

Write today for our latest catalogs!

THE COMMERCIAL SHEARING & STAMPING CO.
YOUNGSTOWN OHIO

UNCLASSIFIED (Contracts Awarded, Cont'd.)

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., Hall Co., to Platte Valley Const. Co., Grand Island, **$50,000.**

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., fire alarm sys., Scottsbluff Co., to R. J. Michael, North Platte, under **$50,000.**

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., Fillmore Co., to Korshoj-Beckenhauer, Blair, Neb., approx. **$50,000.**

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., garage utilities, Scottsbluff Co., to Spiegelberg Lbr. & Supply Co., Laramie, Wyo. Est. under **$50,000.**

†**Nebraska**—PARKING APRON—U. S. Eng., 1709 Jackson St., Omaha, addnl. parking apron, Contr. 25-066-Eng-71, Hall Co., to Booth-Olson, Inc., 622 Ins. Exch. Bldg., Sioux City, Ia., **$100,000.** CD 8/30—ENR 9/2.

†**New Hampshire**—FENCING—U. S. Eng., 31 St. James Ave., Boston, Mass., fencing, No. 19-023-44-NEG-44, to Security Fence Co., 440 Somerville Ave., Somerville, Mass. Est. under **$50,000.** Bids 9/3. CD 9/2—ENR 9/2.

†**New Jersey** — IMPROVEMENTS — U. S. Eng., 120 Wall St., New York 5, N. Y., improvs., addnl. work on Bldg. 101, Essex Co., to Hansen-Jensen Inc., 427 N. Broad St., Elizabeth, **$50,000-$75,000.**

†**New Mexico** — IMPROVEMENTS — U. S. Eng., Commercial Bldg., Albuquerque, improvs., roads, Santa Fe Co., to F. Haake, 1201 Sierra Vista St., Santa Fe, under **$50,000.** Awarded 9/14. CD 9/7—ENR 9/16.

†**New York**—TOPSOILING, etc.—U. S. Eng., Chimes Bldg., Syracuse, topsoiling, seeding, Contr. 321-3ng-1001, Oneida Co., to Provo Bros. Inc., W. Hiawatha Blvd., Syracuse, **$100,000.**

†**North Carolina**—IMPROVEMENTS—U. S. Eng., 308 Customhouse, Wilmington, improvs., clearing, etc., Iden. 982-44-31, Richmond Co., to F. D. Cline, Fairview Rd., Raleigh, under **$50,000.** Bids 9/6, awarded 9/8.

†**North Carolina**—IMPROVEMENTS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., improvs., roads, concrete paving, etc., to Mecklenburg Constr. Co., Durham. Est. **$35,000.** Bids 9/3, awarded 9/12.

†**North Carolina**—IMPROVEMENTS—U. S. Eng., 308 Customhouse, Wilmington, improvs., Iden-982-44-29, New Hanover Co., to F. D. Cline, Fairview Rd., Raleigh, under **$50,000.** Bids 91.

†**N. C., Washington**—AIRPORT PAVING—Civil Aeronautics Admin., 2nd Region, 10-16 Marietta St., Atlanta, Ga., Proposal 24-44, Schedule 2, paving airport, to Dubois Const. Corp., 286 5 Ave., New York, N. Y., over **$50,000.** Bids 9/2.

†**O., Columbus**—PARAPET WALL, etc.—Pub. Bldgs. Admin., 18 and F Sts. NW., Wash., D. C., repairing parapet wall, painting, masonry, etc., at Post Office and Court House, to W. J. Moyer, 3621 S St. N.W., Wash., D. C., **$24,351. FWA.**

†**Ohio**—PARKING APRONS—U. S. Eng., Dayton, parking aprons, Contr. 33-046-eng-17, Montgomery Co., to M. J. Boyle & Co., 1744 N. Mozart St., Chicago, Ill., **$300,000.**

†**Ohio**—WALL FIRE PUMP—U. S. Eng., 700 Union Guardian Bldg., Detroit 31, Mich., addnl. wall fire pump installation, Cuyahoga Co., to Fairbanks Morse & Co., 2810 Superior St., Cleveland; piping and sheet metal work, Cuyahoga Co., to Schweizer-Dippie Co., 2161 E. 16 Pl., Cleveland.

†**Ohio**—WIND TUNNEL, etc.—National Advisory Com. for Aeronautics, Cleveland Airport, Cleveland, icing research wind tunnel and office and shop bldg., to Cleveland Const. Co., 3866 Carnegie Ave., Cleveland, **$150,000.** Bids 8/24. CD 8/12—ENR 8/19.

†**Oklahoma**—CONSTRUCTION—U. S. Eng., 231 W. Main St., Denison, Tex., addnl. construction, Contr. No. 257-eng-2489, Bryan Co., to Morse Bros. & Assoc., Inc., Shreveport, La., **$300,000.**

†**Oklahoma** — CONTROL TOWER — U. S. Eng., 416 Wright Bldg., Tulsa, Zone 2, control tower, etc., Sol. 957-Neg-44-10, Oklahoma Co., to C. M. Suttle, 12 N. W. 5 St., Oklahoma City, **$33,500.** Awarded 9/12.

†**Oklahoma**—IMPROVEMENTS—U. S. Eng., 416 Wright Bldg., Tulsa, Zone 2, improvs., water wells, Oklahoma Co., to Wyatt-Rounder Co., 3428 NW., 18 St., Oklahoma City. Est. under **$25,000.** Bids 9/11. CD 9/8.

†**Oklahoma**—STORAGE FACILITIES—U. S. Eng., 416 Wright Bldg., Tulsa, Zone 2, storage facilities, etc., Sol. 957-neg-44-32, Muskogee and Woodward Counties, to J. H. McCrary, Inc. and J. T. Wilkerson, 1829 N.W. 23 St., Oklahoma City, **$70,000.** Awarded 9/13. CD 8/5—ENR 8/12.

†**Oregon** — CONSTRUCTION — U. S. Eng., Pittock Blk., Portland, heavy construction work, earth moving, etc., Multnomah Co., to Parker-Schramm Co., Couch Bldg., Portland, **$12,000.**

Oregon—RANGES—U. S. Eng., Pittock Blk., Portland, ranges complete with roads and temporary frame bldgs., Contr. 35-026-eng-43, Deschutes Co., to Halvorson Constr. Co. and E. B. Halvorson, 608 1st Natl. Bank Bldg., Salem, **$40,000.**

CLASSIFIED (Contracts Awarded, Cont'd.)

Oregon—TURBINE PARTS—U. S. Eng., ack Blk., Portland, spare parts for erhouse turbines, at Bonneville Dam, to Morgan Smith, Lewis Bldg., Portland, 000.

Texas—FACILITIES—U. S. Eng., 220 W. n St., Denison, facilities, Contr. No. 257-2300, Palo Pinto Co., to J. W. Taylor, las. $90,000.

Texas—PIPELINE CARRIER—Magnolia e Line Co., Esperson Bldg., Houston, ap-x. 50 mi. 8 in. steel pipeline carrier be-en Seminole and Midland, force account. 000. CD 9/15.

Tex., Driscoll—OIL WELL—Providence Oil Gulf Bldg., Houston, drilling, developing test oil well, Driscoll Field, to Wynn by Drilling Co., Esperson Bldg., Houston. rox. $25,000.

Tex., Eagle Lake—IMPROVEMENTS—ds & Docks, Navy Dpt., 18 St. and Con-tution Ave. N. W., Wash., D. C., imprvs., ing. NAS, NOY 7408, to General Constr. Box 1524, Fort Worth, $94,238.

Tex., Garden City—OIL WELL—McElry h Co., Crane, and J. W. Emch, San elo, drilling, casing, developing new 3,500 test oil well, to A. E. Walker, Big Spring, rox. $25,000.

Tex., Houston—IMPROVEMENTS—City, rvs., concrete paving, to Brown & Root, Calhoun Rd., about $25,000.

Tex., Tilden—OIL WELL—Stanolind Oil & Co., Fair Bldg., Ft. Worth, drilling, cas-developing oil well, to A. Buchanan, no Natl. Bldg., San Antonio, approx. 000.

Tex., Iraan—PIPELINE—E. J. McCurdy, Bldg., Fort Worth, laying 2½ in. con-ing 4 wells and main pipeline. Owner ds. $32,000. CD 9/14—ENR 9/16.

Utah—DUST CONTROL FACILITIES—S. Eng., 32 Exchange Pl., Salt Lake City, t control facilities, to W. W. Gardner, urban Depot Bldg., Salt Lake City, ap-x. $28,000. Bids 9/7.

Utah—FACILITIES—U. S. Eng., 32 Ex-nge Pl., Salt Lake City, addnl. facilities, Lake Co., to R. J. Daum Constr. Co., 624 on Bldg., Salt Lake City, under $50,000.

Virginia—POWER LINE—U. S. Eng., Norfolk, Norfolk, overhead electrical r line, Contr. 616-eng-2622, Northampton to Boney Constr. Co., 2411 Kimball Ter-, Norfolk, $30,000.

How to save time by doing *more* reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

PALMER Filter Bed AGITATORS *Prevent Sand Beds from Cracking*

Maintenance problems of sand beds are greatly reduced when you install a Palmer Filter Bed Agitator. Because these agitators keep the beds in proper condition—prevent cracking and shrinking!

But that isn't all. Palmer Agitators provide 40% reduction in wash water—50% increase in filter capacity!

Moreover, they give you longer filter runs . . . completely eliminate mud balls . . . reduce chlorine demand because of removal of organic matter from the sand . . . and produce "new" sand after less than three weeks of operation.

You get purer, better testing water, too. So—if you're responsible for the purity of water supplied to municipal or industrial users, it will pay you to use Palmer Filter Bed Agitators. They can be incorporated in new or existing plants.

Write today for further details and list showing installations.

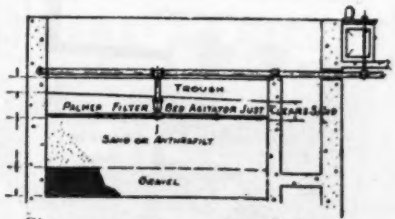
SOME RECENT INSTALLATIONS

Municipal Installations—Over 1000 units from New England to South America

Industrial Concerns include:

Anheuser Busch, Inc.
E. I. DuPont De Nemours & Co. (8 plants)
General Electric Co.
Hammermill Paper Co.
New Bedford Rayon Co.
RCA Manufacturing Co.

and many military plants at censored locations



City water pressure is sufficient to operate the revolving arms and develop a high velocity, low volume jet action which completely scours the expanded filter medium.

STUART-BRUMLEY CORP., 516 N. CHARLES ST., BALTIMORE-1, MD.

STUART-BRUMLEY

ACTIVATED ALUM • BLACKALUM • PALMER FILTER BED AGITATORS

APS
PROTECTED STEEL
ROOFING and SIDING
...available now!

Protected against weather extremes

...from the winds and snows of the Aleutians to the tropical sun and rains of the Canal Zone.

Easy to erect

The steel-core provides a sheet strong and rigid, yet light enough in weight to be easily handled and erected.

Withstands acid fumes and salt air

...made possible by exclusive, chemically inert, A P S Weather-Tested coating.

Needs no painting

The exterior mica coating is attractive, durable, and minimizes maintenance.

Jobbers Coast to Coast

PROTECTED STEEL PRODUCTS CO.
General Office and Plant,
WASHINGTON, PA.

UNCLASSIFIED (Contracts Awarded, etc., Cont'd.)

†**Washington**—CONSTRUCTION—U. S. Eng., 800 3 Ave., Seattle 4, addnl. construction, installation, King Co., to A. F. Mowat Constr. Co., 1231 3 Ave. Bldg., Seattle, Zone 1, $60,000.

†**Washington**—CONSTRUCTION—U. S. Eng., 800 3 Ave., Seattle, Zone 4, addnl. construction, Clallam Co., to Sound Construction & Engineering Co., Northern Life Tower, Seattle, Zone 1, $200,000.

†**Washington** — ELECTRICAL SYSTEM — U. S. Eng., 800 3 Ave., Seattle, Zone 4, electrical sys., King Co., to Woodworth & Co. and Macdonald Bldg. Co., Moses Lake, $60,000.

†**Washington** — IMPROVEMENTS — U. S. Eng., 800 3 Ave., Seattle 4, imprvs., Spokane Co., to J. H. Collins & Co. and Northwest Pavers, P. O. Box 135, Spokane, $300,000.

PUBLIC BUILDINGS

PROPOSED WORK

†**Alabama**—Rheem Mfg. Co., 2901 35 Ave. N., Birmingham, addnl. plant facilities. $115,000. Defense Plant Corp. will finance.

†**Ala., Ozark**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., Dale Co. health center, Docket Ala. 1-255. **FWA.**

†**Arizona**—Mohave Co., Housing Auth., Court House, Kingman, plans by Lescher & Mahoney, Title & Trust Bldg., Phoenix, family dwelling units, Ariz. 2331 and Ariz. 2332, for NHA. CD 9/9—ENR 9/16.

†**California**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, plans by T. L. Pflueger, 530 Market St., San Francisco, and C. F. Gromme, Albert Bldg., San Rafael, family dwelling units, Calif. 4751. E. Elmore Hutchinson, 58 Sutter St., San Francisco, engr. CD 9/3—ENR 9/9.

California—Sonoma Co., Court House, Santa Rosa, plans by Douglas D. Stone & Louis B. Mulloy, assoc. archts., 381 Bush St., San Francisco, nurses' home. $150,000.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, housing, northern California, Job 1073.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, bldgs., Job 1120, northern California.

†**California**—City and County of San Francisco Housing Auth., 525 Market St., San Francisco, commercial bldg. for housing, Calif. 4664, for NHA. E. T. Spencer, 369 Pine St., and W. C. Ambrose, 244 Kearny St., both San Francisco, archts.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, bldgs., Spec. 1048 and 1148, San Francisco Co.

†**Calif., San Francisco**—Home Owners' Loan Corp., Pacific Bldg., San Francisco, plans by M. A. Sheldon, 681 Market St., San Francisco, converting residence at 884 41 Ave., into addnl. living units, Case No. W4A-1028. $5,000.

★†**Connecticut**—United Aircraft Corp., 400 Main St., Hartford, addnl. plant facilities, $2,200,000. Defense Plant Corp. will finance.

Ga., Brunswick—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, 200 trailers or portable shelter units, Ga. 9165; 225 dormitory units, Ga. 9164.

★†**Ga., Dublin**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., NOY 6946, site preparation, railroad and grading, $60,000; NOY 6947, 8 ward bldgs., $800,000; NOY 6948, central bldg., $1,000,000; NOY 6949, power plant, laundry and steam tunnels, $300,000; NOY 6950, personnel and service bldg., $800,000; NOY 6951, roads, walks and services, $500,000; NOY 6555, facilities for 500 bed hospital, $3,400,000. Robert & Co., Inc., Bona Allen Bldg., Atlanta, engrs. and archts.

†**Ill., Amboy**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, 40 trailers or portable shelter units, Ill. 11205.

†**Indiana**—Eli Lilly Corp., 740 S. Alabama St., Indianapolis, penicillin plant. $370,000. Federally financed.

†**Indiana** — Phelps Dodge Corp., Lincoln Hy. E., Fort Wayne, bids soon, 1 story, brick, concrete, structural steel aluminum castings plant addn. $15,000,000. Defense Plant Corp. will finance. CD 9/14—ENR 9/16.

†**Ind., Evansville**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., 50 trailer housing, Ind. 12176.

†**Ind., Evansville**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., 150 unit family dwellings, Ind. 12177.

†**Louisiana**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., bldg. $97,000.

†**La., Leesville**—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., 25, D. C., hospital bldg., Docket La. 16-210. **FWA.**

†**Me., Portland**—Federal Works Agency, 99 Chauncy St., Boston, Mass., altering Buick Sales bldg. into recreational bldg.

†**Maryland**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., plans by Eggers & Higgins, 542 5 Ave., New York, N. Y., reconstructing bldg. $150,000.

JAEGER "SURE PRIME"

—the Pumps that exceed their promises

with up to 5 times faster priming, with hi-head, hi-capacity performance, with thousands of extra hours of trouble-free service.

Self-cleaning design, replaceable liners, longest life seal, heavy duty construction thruout.

Every unit individually tested and certified — you *know* you're getting the best.

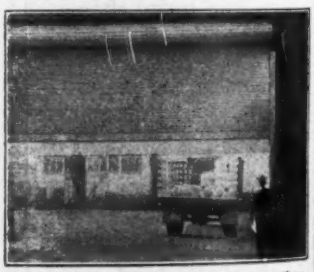
Sizes 3000 to over 200,000 G.P.H.

52 Lb. Bantam —3000 G.P.H.

THE JAEGER MACHINE CO.
200 Dublin Ave., Columbus, Ohio

Traffic is Handled More Efficiently Since Our Plant was Equipped with Kinnear Rolling Doors!

KINNEAR WOOD ROLLING DOORS



Traffic and materials-handling operations move more efficiently in Kinnear-equipped plants! With Kinnear Motor Operators added (and remote control switches if desired) doors can be controlled with minimum manpower. The doors open out of the way, safe from damage—all surrounding space remains clear at all times. Kinnear WOOD Rolling Doors are available for current wartime needs. Write for information. The Kinnear Mfg. Co., 1880-90 Fields Ave., Columbus 16, Ohio.

Saving Ways in Doorways
KINNEAR ROLLING DOORS

BLIC BLDGS. (Proposed Work, Cont'd.)

Maryland—Yards & Docks, Navy Dpt., 23 St. and Constitution Ave. N.W., Wash., C., housing, etc., incl. firehouse, school, ds, roads, water supply and distr., sewage nical sys., heating plant, steam distr. and er plant. $3,666,000.

Md., Baltimore—Pub. Housing Auth., A, Temporary Bldg. 2, 19 and D Sts. W., Wash., D. C., plans by H. R. Robin- 1927 11 St. N.W., Wash., 1, D. C., 750 ily dwelling unit housing, Md. 18250; ns by A. I. Cassell, 1903 14 St. N.W., sh., D. C., 650 family dwelling unit hous- Md. 18252. CD 8/17—ENR 8/19.

Md., Leonardtown—Bd. Comrs. St. Marys Leonardtown, plans by J. J. Waldron, 15 St. N.W., Wash., D. C., and bids soon bldg., central heating plant and office erations.

Mass., Boston—Home Owners' Loan Corp., ark Ave., New York, N. Y., 200 unit fam- conversion program.

Mich., Niles—City, Pawating Hospital Bldg. , Niles, hospital addn. $275,000. **FWA.** 7/2/43—ENR 7/9/43.

Mich., Pontiac—Pub. Housing Auth., NHA, E. 9 St., Cleveland, O., 180 family llings, Mich. 20218.

Mississippi—Pub. Housing Auth., NHA, rgia Savings Bank Bldg., Peachtree and ad Sts., Atlanta, Ga., will not construct sing, Miss. 22169. Project cancelled. CD 4—ENR 8/5.

Mo., Malden—Malden School Bd., c/o R. E. hols, supt. plans by Wm. B. Ittner, Inc., 408 Education Bldg., 911 Locust St., St. Louis, onstruction, completion 2 wing school addn., odeling basement into playroom. $40,000. plied to FWA.

Neb., Neosho — Construction, completion ns. to 2 recreational bldgs. $25,000. Applied FWA. Neville & Sharp, 1321 Baltimore St., nsas City, Mo., archts.

New Hampshire—Pub. Housing Auth., A, 24 School St., Boston, Mass., rejected Sept. 9, community bldg., site imprvs., 27021. Will readvertise. CD 9/2— 8/26.

New Mexico—U. S. Eng., 4 and Gold Sts., uquerque, bldg., utilities, appurtenances, ves Co. $40,000.

New York—Edo Aircraft Corp., 13-16 111 St., College Point, completed plans mfg. $1,750,000. Federally financed.

N. C., Chapel Hill—Town issuing $10,000 ds. for site and part construction cost of reation center bldg., Henderson St. R. W. ry, mayor. **FWA.**

Ohio—Goodyear Tire & Rubber Co., 1144 Market St., Akron, 1 story, 80x160 ft. thetic rubber research laboratory, $75,000, rally financed. J. Gordon Turnbull, 2630 ster Ave., Cleveland, engr.

O., Akron—Pub. Housing Auth., NHA, E. 9 St., Cleveland, 500 unit family llings, Ohio 33279.

O., Akron—Pub. Housing Auth., NHA, E. 9 St., Cleveland, 500 trailers or port- shelter units, Ohio 33280.

O., Cleveland—Pub. Housing Auth., NHA, E. 9 St., Cleveland, 500 trailers or port- shelter units, Ohio 33281.

Oregon—Shofner Iron & Steel Wks., 2770 W. Yeon Ave., Portland, addnl. plant fa- ies, $75,000. Defense Plant Corp. will ance.

Oregon—Pub. Housing Auth., NHA, Skin- er Bldg., 5 Ave. and Union St., Seattle 1, ., plans by Stanton & Johnston, and chlosser & Roehr, all at Railway Ex- ge Bldg., and Jones & Marsh, Woodlark ., all in Portland, housing. $3,000,000. 9/14—ENR 9/16.

Pa., Mapleton—Pub. Housing Auth., Skinner Bldg., 5 Ave. and Union St., e, 1, Wash., 30 unit family dwellings, 35280.

Pennsylvania—U. S. Eng., Transfer, plans rack & Prack, 119 Federal St., Pittsburgh, , Butler Co.

Pennsylvania—Sun Oil Co., 1608 Walnut ., Phila., plant facilities. $3,175,000. se Plant Corp. will finance.

Pa., Pottstown—Pub. Housing Auth., NHA, Sway., New York, 7, N. Y., 160 unit y dwellings, Pa. 36440.

R. I., Newport—Pub. Housing Auth., 24 School St., Boston, Mass., 144 unit tory housing, R. I. 37051.

Texas—Pub. Housing Auth., NHA, 1205 ectric Bldg., Ft. Worth, dwelling units, 1040. CD 9/9—ENR 9/16.

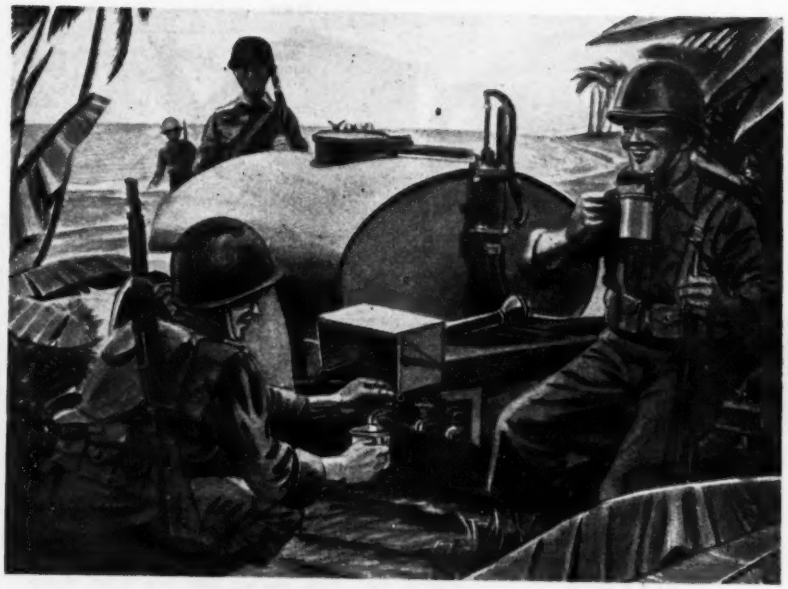
Tex., Ballinger—Pub. Housing Auth., 1205 Electric Bldg., Seventh and Tay- s., Fort Worth, 40 family dwelling Tex. 41612.

Tex., Brady—Home Owners' Loan Corp., Exchange Bldg., Dallas, 20 unit fam- nversion program.

Tex., San Antonio—Home Owners' Loan Cotton Exchange Bldg., Dallas, 150 family conversion program.

Utah—U. S. Eng., 32 Exchange Pl., Salt ke City, bldg., Weber Co. $1,000,000.

Utah, Tooele—Pub. Housing Auth., NHA, Bldg., 1006 Grand Ave., Kansas City, 50 trailers (from Utah 42048). Utah



"WATER BOY"

Today, wherever our American Armies are fighting, there you'll find BEN-HUR Trailers—some carrying water, others heavily loaded with all kinds of fighting "cargo". . . . Standing up to the toughest travel, yet designed for easy loading.

The special designing and engineering skill and experience so long developed at BEN-HUR is YOURS to use now in developing your post-war product plans—particularly those involving material transport or providing easy mobility for special units.

Let's get together on some of these problems of yours. Our engineers will be glad to help you to profitable solutions in preparation for post-war markets.

BEN-HUR MFG. CO.

634 East Keefe Avenue **Milwaukee 12, Wisconsin**

ARMY (E) NAVY

Awarded to Ben-Hur for Outstanding War Production

BEN-HUR

INDUSTRIAL TRAILERS

ALCO

ELECTRIC WELDED STEEL PIPE

For Permanent Installations

AMERICAN LOCOMOTIVE COMPANY

ALCO PRODUCTS DIVISION

30 CHURCH ST., NEW YORK, N. Y. DUNKIRK, N. Y.

One way to beat the truck shortage

This "action shot" of the Brooks

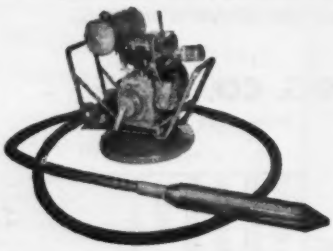
LOAD LUGGER

shows how easy it is to operate. Only 15 seconds for dumping, loading, or spreading.

Just mount a LOAD LUGGER on the chassis and make one truck do the work of many! The more detachable "bodies" used with each unit, the fewer trucks required to do a given material-moving job. Pick 'em up, haul 'em away, dump 'em and return 'em for refilling. That's the fastest and cheapest method of handling riprap, feeding crushers, road building, construction work, quarry operations and general industrial hauling jobs. Less manpower needed, more time saved. Ask for Catalog No. 44.

2209 Davenport Road, Knoxville, Tenn.
Distributors in all Principal Cities

Brooks EQUIPMENT AND MFG. CO.



Concrete
VIBRATORS
Gasoline Engine or Electric Motor Driven
CONCRETE GRINDERS

Other Products
FRONT END SHOVELS
for Industrial Tractors
HEATING KETTLES
for Asphalt and Tar
AGGREGATE DRYERS
for Stone and Sand
ASPHALT PLANTS
Portable — Stationary

Write for Circulars

White Mfg. Co.
ELKHART INDIANA

MORETRENCH WELLPOINT SYSTEMS

FOR DRY SUBGRADES
AT LOW COST
ON ANY WET JOB
★
FOR WATER SUPPLY
★
QUICK DELIVERY OUT OF STOCK

Rental — Sales — Contracts

MORETRENCH CORPORATION
90 West St., New York, N. Y.
Rockaway, N. J., Chicago, Ill.
New Orleans, La.

PUBLIC BLDGS. (Proposed Work, Contracts)

†**Virginia**—U. S. Eng., Fort Norfolk, Norfolk, bldg. addn., Warwick Co. $[illegible] (**Correction**—Engineers address.) CD 9/[illegible] ENR 9/16.

†**Wash., Bremerton**—Pub. Housing Auth., NHA., Skinner Bldg., 5 Ave. and Union, Seattle, Zone 1, 280 unit dormitories, conversion of bunkhouses, Wash. 45242.

†**Wash., Port Orchard**—School Bd., Port Orchard, plans by F. H. Stephen, Smith Tower, Seattle, Zone 4. Junior High School addn. $32,190. **FWA.**

†**Wash., Wenatchee**—Pub. Housing Auth., NHA, Skinner Bldg., 5th Ave. and Union, Seattle, 1, 20 unit family dwellings, Wash. 45239.

†**Wyo., Rawlins**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 100 trailers or portable shelter units, Wyoming, Wyo. 48086.

Que., Amos—Dpt. P. Wks., Quebec, Can., sanatorium for treatment of tuberculosis in district which centre at Rouyn Noranda, Val d'Or and Cadillac. $250,000.

Puerto Rico, San Juan—Insular Emergency Council, San Juan, recommended sum of $[illegible],000 be made available to Dpt. Interior of Puerto Rico for new construction of school bldgs., equipment, land acquisition, school lunch room spaces, other facilities; also $[illegible],000 to be used as sponsorship with Federal Works Agency for construction of new schools throughout the island, total cost approx. $[illegible],000.

Man., Winnipeg—Dpt. Munition & Supply, engrs., Wellington St., Ottawa, Ont., machine shop, repair shop and testing house, for Dominion Government, Ottawa, Ont. $50,000.

Ont., Guelph—R. B. Robson, mayor, hospital, $175,000.

Ont., Leamington—Leamington Dist. Memorial Hospital, c/o L. R. Omstead, Wheatley, hospital. $150,000.

Ont., St. Catherines—H. H. Smith, municipality clk., home for the aged, on 50 acre site near here. $150,000.

Ont., Sarnia—Municipality, converting army dwellings and other bldgs. to relieve housing situation. $150,000. Architect c/o Housing Administration, Dpt. Finance, Ottawa.

Ont., Toronto—Housing Admin., c/o R. W. G. Card, 142 Chester Ave., plans by Forsey, Page & Steele, 20 St. Clair Ave., altering 4 bldgs. into apartment blocks. $200,000.

★**Ont., Windsor**—Bd. Educ., Windsor, collegiate construction. $500,000.

Ont., Windsor—Housing Admin., Dpt. Finance, Ottawa, remodeling dwellings, etc. $150,000. Architect, c/o The Advisory Bd., Windsor.

Que., Montreal—Owner, c/o Dpt. Munitions & Supply, Wellington St., Ottawa, Ont., plant and equipment for production of penicillin. $250,000.

BIDS ASKED

Bids Asked after September 17

†**N. J., Long Branch**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., community bldg., NJ.-28021. Plans deposit $[illegible], H. I. Braun, 191 Bway., archt. CD 9/15—ENR 8/26.

†**N. Y., Greenport**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., 50 pairs, housing, NY-30032. Plans deposit $[illegible], G. A. Boehm, 2 W. 45 St., New York, archt. CD 9/9—ENR 9/16.

Bids Asked after September 20

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., tenant activity facilities, Pa. 36241. Harrison Twp., Allegheny County Housing Auth., 201 County Office Bldg., Pittsburgh. Plans deposit $[illegible], CD 9/9—ENR 9/16.

Bids Asked after September 21

Va., Newport News—City Manager, City Hall, police admin. bldg. $350,000. Williams, Colle & Pipino, Nelson Bldg., engrs. CD 15—ENR 8/26.

Bids Asked September 27

★†**New York**—Beck & Tinkham, archts., Bailey Bldg., Jamestown, plant addn., for American Aviation Corp., R. N. Webster, pres., P. O. Box, Jamestown. $950,000. Defense Plant Corp. will finance. CD 7/30—ENR 7/5.

Bids Asked September 28

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York 7, N. Y., community and commercial bldgs., site imprvs., Pa. 36[illegible], for Allegheny County Housing Auth., 201 County Office Bldg., Pittsburgh. Plans deposit $35., Button, Sterling & McLean, 2 E. Montgomery Ave., NS Pittsburgh, archts. CD 9/16—ENR 9/16.

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York 7, N. Y., community bldg. and site imprvs., Pa. $6171, for Allegheny County Housing Auth., 201 County Office Bldg., Pittsburgh. Extended date. CD 9/16—ENR 9/2.

†**Va., Lackey**—Federal Works Agency, Planters Bank Bldg., Richmond. Zone [illegible], story, frame recreation center. $[illegible], FWA allot. **Carneal, Johnson & Wright,** Atlantic Life Bldg., Richmond, archts. CD 9/8—ENR 9/16.

LIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked September 29

—Pub. Housing Auth., NHA, 1205 ic Bldg., Seventh and Taylor Sts., Fort school bldgs., Tex. 41-607. Plans de- $50. M. Lemmon, Tower Petroleum Dallas archt. CD 9/7—ENR 9/9.

Bids Asked September 30

rgia—Pub. Housing Auth., NHA, a Savings Bank Bldg., Peachtree and Sts., Atlanta, family dwelling units. 161. Plans deposit $50. O. C. Pound- Palmer Bldg., and J. W. Cooper, For- Bldg., Atlanta, archts. CD 8/25—ENR

lahoma—Pub. Housing Auth., NHA, lectric Bldg., 7 and Taylor Sts., Fort Tex., family housing, Okla., 34075. ed date. Plans deposit $50. Senter, & Craig, 407 Philtower Bldg., Tulsa, CD 9/9—ENR 9/16.

Bids Asked after September 30

Dravosburg—Pub. Housing Auth., 270 Bway., New York, 7, N. Y., com- y bldg., Pa., 36181 for Allegheny Co. g Auth., 201 County Office Bldg., rgh. Plans deposit $25.

Bids Asked in October

wa—U. S. Eng., 1709 Jackson St., naha, Neb., housing, Page Co. $1,000,000. & Woodburn, 310 Old Colony Bldg., Des , engrs.-archts. CD 9/15—ENR 8/26.

Bids Asked after October 1

Y., Hempstead—Pub. Housing Auth., 270 Bway., New York, 7, N. Y., com- y bldg., N.Y. 30021. Plans deposit $10. Boehm, 2 W. 45 St., New York, archt.

Y., Rockville Centre—Mercy Hospital, dge Ave., Mercy Hospital addn., Docket 9-231. $290,000. **FWA.** J. Gunther, 193 way Ave., Valley Stream, archt. CD ENR 7/29.

Bids Asked after October 4

J., Dover—Pub. Housing Auth., NHA, way., New York, 7, N. Y., commercial NJ-28101. Plans deposit $10. S. ker, 195 Van Houten St., Paterson, CD 4/23—ENR 4/29.

Bids Asked October 5

J., Long Branch—Pub. Bldgs. Admin., F Sts. N.W., Wash., 25, D. C., hospital NJ 28-123. $126,000. **FWA.** Epples ns, 16 Washington St., Newark, archts. 15—ENR 6/24.

h., Seattle—King Co. Medical Service c/o Dr. A. J. Bowles, 410 Orpheum Seattle, 1, 2 story, bsmnt., 250x rein.-con. hospital. Plans deposit $50. Stoddard, Orpheum Bldg., Zone 1, archt. 7—ENR 4/31.

Bids Asked October 6

Y., Kings Park—Comr. Mental Hygiene, Office Bldg., Albany, steam service tun- Veterans' Group, Kings Park State Hos- Spec. 11612. $105,000. Plans deposit CD 9/14—ENR 9/16.

Bids Asked October 7

th Carolina—Pub. Housing Auth., NHA, n Savings Bank Bldg., Peachtree and Sts, Atlanta, Ga., 4 school bldgs., for SC 38026. Plans deposit $50. H. O. 24 Broad St., Charleston, archt.

Bids Asked October 8

Huntsville—Pub. Bldgs. Admin., 18 Sts. N.W., Wash., 25, D. C., schools, A and B, Docket Ala. 1-213. **FWA.** ed date. C. C. Pearson, 115 S. Union ontgomery, archt. CD 8/24—ENR 8/26.

ando—Pub. Housing Auth., NHA, Dierks 1006 Grand Ave., Kansas City, Mo., g units and community bldg., Colo. 5107, ed date. T. H. Buell & Co., 720 14 St., archt. CD 9/13.

Bids Asked October 14

Mad River Twp.—Pub. Bldgs. Admin., F Sts. N.W., Wash., 25, D. C., Overlook School bldg. Walker, Norwick & Tem- merican Savings Bldg., Dayton, archts. 7.

Bids Asked about October 21

Erie—Hamot Hospital, Erie, hospital Docket Pa. 26-152. $327,000. Extended **WA.** Meyers & Johnson, 821 Commerce archts. CD 9/20—ENR 9/16.

Bids Asked

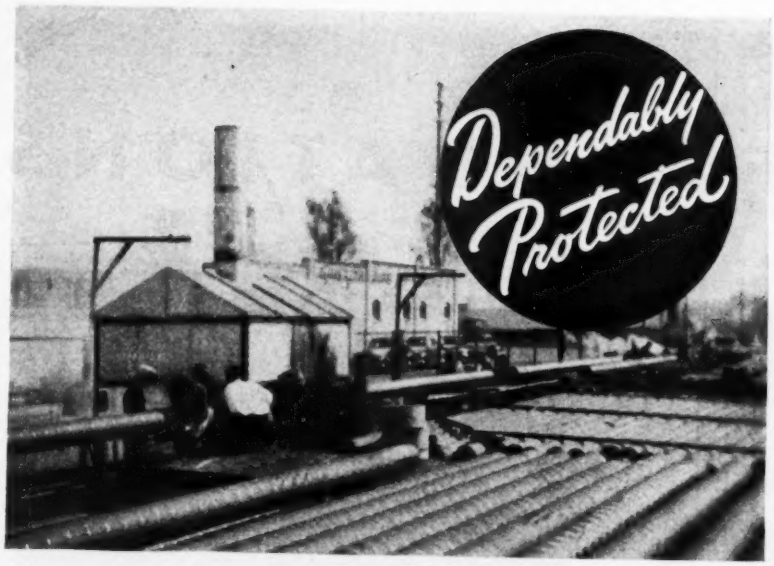
ornia—Pub. Housing Auth., NHA, 785 St., San Francisco, family dwelling Calif. 4745. Blanchard, Maher & Ward, e St., San Francisco, archts. CD 9/3 9/8.

necticut—Yards & Docks, Navy Dpt., 18 Constitution Ave. N.W., Wash., D. C., d bidders), brick bldg.

achusetts—U. S. Eng., 31 St. James oston, temporary bldgs., No. 19-023-44- 2, Suffolk Co. Under $50,000.

achusetts—U. S. Eng., 31 St. James oston (selected list bidders), concrete No. 19-023-44-NEG 69.

Jersey—U. S. Eng., 6 and Walnut lla., Pa., bldgs., Monmouth Co. $50,-



With REILLY PIPE ENAMEL

★ Pipe lines coated with REILLY Enamel are exceptionally free from costly service interruptions. The tough, durable REILLY coating gives dependable protection against corrosion from all causes, is highly resistant to abrasion and soil stress, and is unaffected by extremes of temperature. The ability of REILLY Enamel to give dependable, low-cost protection under all conditions of service has been proved over a long period of years.

Booklet describing REILLY *Protective Coatings will be sent on request.*

Reilly COAL TAR PRODUCTS

REILLY TAR & CHEMICAL CORPORATION

Executive Offices: Merchants Bank Building, Indianapolis, Indiana

2513 S. DAMEN AVENUE, CHICAGO, ILLINOIS 500 FIFTH AVENUE, NEW YORK, N. Y. ST. LOUIS PARK, MINNEAPOLIS, MINN.

SEVENTEEN · PLANTS · TO · SERVE · YOU

UNDERPINNING & FOUNDATION CO., Inc

Engineers & Contractors

155 E 44 St., NEW YORK

FOUNDATIONS

PRETEST UNDERPINNING
CONCRETE-STEEL PILES
MASS CONCRETE CONSTRUCTION
HEAVY SHORING
DRILLED-IN CAISSONS

Send for catalogs descriptive of the latest foundation types and methods

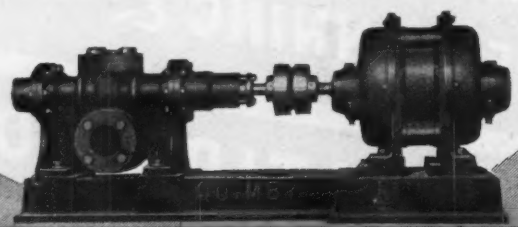
SPENCER, WHITE & PRENTIS, INC.
10 EAST 40th ST. NEW YORK, N. Y.

QUIMBY PUMPS

SCREW PUMPS
CENTRIFUGAL PUMPS
CHEMICAL PUMPS
ROTEX PUMPS

... a Quimby Pump for every purpose

- Skilfully designed for efficiency and easy maintenance
- Generously proportioned for strength and long life
- Ruggedly built for dependability in emergencies



PORTER Better Built Equipment Established 1866

QUIMBY PUMP COMPANY
INCORPORATED
Division of H. K. PORTER COMPANY, Inc.
GENERAL OFFICES PITTSBURGH (1) PENNSYLVANIA
FACTORIES PITTSBURGH AND BLAIRSVILLE, PA. NEWARK AND NEW BRUNSWICK, N. J.

PUBLIC BLDGS. (Bids Asked, Contd.)

†N. C., Goldsboro—Pub. Bldgs. Admin., ... and F Sts. N.W., Wash., D. C., public ... center. $160,000. Extended date. A. J. Maxw... 509 Borden Bldg., archt. CD 8/24—ENR 8/26

†Pennsylvania—Public Housing Auth., NHA, ... 270 Bway., New York, 7, N. Y., comm... bldg., site improvs., Pa. 36201, for Allegh... County Housing Auth., 201 County Office Bldg., Pittsburgh. CD 9/8—ENR 9/16, under BA.

†Texas—Sheffield Steel Corp., Industrial D... Houston, brick, rein.-con. addnl. plant con... $150,000. Defense Plant Corp. will finance.

†Texas—Shredded Steel Co., 1518 Oliver ... oil storage bldg., lean-to, scale pits, ... paving, etc. Defense Plant Corp., 811 Verm... Ave. N.W., Wash., D. C., will finance. CD ... —ENR 9/16, under Industrial Bldgs.

LOW BIDDERS

†Louisiana—Pub. Housing Auth., NHA, ... Electric Bldg., 7 and Taylor Sts., Fort Wor... Tex., Sept. 16, site development for tra... housing, La. 16056, from Tellepsen Constr. C... 3900 Clay St., Houston, Tex., $44,500. CD ... —ENR 9/2.

†New Jersey—Pub. Housing Auth., NH... 270 Bway., New York, 7, N. Y., Sept. 8, ... facing streets for housing, NJ 26071, fr... Robert Bossert & Sons, 206 1 St., Newa... $43,416. CD 9/3.

†New Mexico—Public Housing Auth., NH... 1205 Electric Bldg., Fort Worth, Tex., Se... 15, housing, NM 29168, from L. McMurt... Amarillo, Tex., $385,000. CD 9/8—ENR 9/9

†New York—Pub. Housing Auth., NHA, ... Bway., New York, Zone 7, Sept. 15, dwellin... NY 30170, from Delval Constr. Co., Harw... Bldg., Scarsdale. $479,873. CD 9/9—ENR 9/...

†North Carolina—American Enka Corp., Enka, Sept. 15, 2 addns. to chemical bldg., from Potter & Shackelford, Inc., Greenville, S. C., $66,990. Federally financed. CD 9/3.

★ **†Texas**—Pub. Housing Auth., NHA, ... Electric Bldg., Seventh and Taylor Sts., Forth Worth, Sept. 18, dwelling units, Tex. 41605 and Tex. 41609, from Rob. E. McKe... El Paso, $1,408,000. CD 9/16.

†Wisconsin—Pub. Housing Auth., NHA, ... N. Wells St., Chicago, Ill., Sept. 13, housi... Wis. 47041, from Kileen & Wille, Superi... $167,560. CD 8/10—ENR 8/19.

CONTRACTS AWARDED

†California—Yards & Docks, Navy Dpt., ... St. and Constitution Ave. N.W., Wash., D. C... bldg., NOY 6750, Alameda Co., to Mose... Bros., 475 6 St., San Francisco, $161,000.

Conn., Southbury—State, State Capito... Hartford, power plant alterations, equi... Southbury Training School, to C. N. Flagg ... Co. Inc., 79 Griswold St., Meriden, $48,1... Henri B. Van Zelm, 11 Asylum St., Hartfo... engr.

★ **†Delaware**—Nicaro Nickel Co., 205 E. ... St., New York, N. Y., enlarging, rehabi... tating plant for smelting nickel oxide, ... Turner Constr. Co., 69 St. and Elmwood Ave... Phila., Pa. Est. $700,000. Defense Plan... Corp. will finance.

†D. C., Wash—Pub. Bldgs. Admin., 18 a... F Sts., Zone 25, 3 story exten. to tempor... F.O.B. T-5, to Charles H. Tompkins Co., ... 16 St. N.W., $174,180.

†Fla., Boca Chica—Yards & Docks, Na... Dpt., 18 St. and Constitution Ave. N.W., Was... D. C., bldg., miscellaneous facilities, A.A.... NOY 7087, to The Mackie Co., 2825 S.W. ... St., Miami, $255,400.

†Georgia—U. S. Eng., Grant St. west ... Westwood St., Mobile, Ala., shipping cen... Chattahoochie Co., to Foster-Creighton C... American National Bank Bldg., Nashvi... Tenn., $80,000.

†Georgia—U. S. Eng., Post Office Bld... Savannah, bldg., Floyd Co., to Southeast... Constr. Co., 218 W. 2 St., Charlotte, N. ... approx. $70,000. Bids 9/1. Robert & C... Bona Allen Bldg., Atlanta, engrs. Bids 9/1.

†Georgia—Yards & Docks, Navy Dpt., ... St. and Constitution Ave. N.W., Wash., D. ... site preparation for bldg., to R. A. Bow... Constr. Co., Macon. $225,000. Robert & C... Inc., Bona Allen Bldg., Atlanta, archts.

Ind., Anderson—H. E. Hudson, chn. Bd. ... Wks., rebuilding turbine generator, in ... plant, to General Engineering Co., 1843 ... Alabama St., Indianapolis, $115,000.

★ **Ind., Evansville**—Bd. Trustees Evansv... State Hospital, G. W. Schnute, pres., ... building State Insane Hospital, incl. ... patients' bldg., administration bldg., ... stone superintendent's residence, to Gust ... Newberg Constr. Co., 9 S. Clinton St., Chica... Ill., $1,493,000***heating, ventilating, to L. ... Stevens Co., 626 Broadway, Cincinnati, ... $187,454***plumbing, refrigerating, to ... State Plumbing & Heating Co., 1114 Main ... $162,441***electric wiring, to Watson-Fla... Engineering Co., 11 W 17 St., Indianapo... $99,352. Grand total $1,933,147. Bids ... awarded 9/14. CD 9/14—ENR 9/16, un... LB.

†Ind., Indianapolis—Yards & Docks, Na... Dpt., 18 St. and Constitution Ave. N.W., Was... D. C., enlargement to laboratory bldg., NO... P/20011, to Wm. P. Jungclaus Co. Inc., ... Mass. Ave., Indianapolis, $91,230.

LIC BLDGS. (Contracts Awarded, Cont'd.)

...wa—Defense Plant Corp., 811 Vermont ... N.W., Wash., D. C., alcohol plant, to ... Const. Co., 406 Fleming Bldg., Des ...nes, and Preister Constr. Co., Davenport ... Bldg., Davenport. Est. $270,000.

...Ky., Ashland—Ashland Hospital, D. H ...ham, chs., 1103 Second Natl. Bldg., 3 ...y, 58x78 ft., and 42x54 ft. wing, brick, ...con. hospital addn., Ky. 15165, to J. M. ...ins & E. P. May, 1110 N. Broad St., Lex... ...on. $203,500. FWA. P. G. Mueller, Ham... ...n Hotel, Hamilton, O., archt.

...Louisiana—U. S. Eng., 25 St. and Avenue ...Galveston, Tex., bldg. facilities, Solic. 359... ...28, Orleans Parish, to Boh Bros. Const. ...2460 Cypress St., New Orleans, under ...,000. Bids 9/11.

...Maine—Pub. Housing Auth., NHA., 24 ...School St., Boston, Mass., housing, Me. 17... ...and 17062, to John Bowen Co., 129 Newbury ...Boston, Mass., $999,000. Bids 9/7. CD ...—ENR 9/16, under LB.

...Maine—U. S. Eng., 31 St. James Ave., ...ton, Mass., Concrete bldgs., structures, ...19-23-44-Neg 46, to M. Spinelli & Sons ...Inc., 31 Chauncy St., Boston, Mass. Est. ...,000-$500,000. Bids 9/10.

...Michigan—U. S. Eng., 700 Union Guardian ...g., Detroit, Zone 31, mess hall, Wayne Co., ...y H. Martin Constr. Co., 955 E. Jefferson ... Detroit.

...Minnesota—Northwest Flax Industries, ...Windom, general contract flax processing ...t, to Kileen & Willie Constr. Co., 1716 ...ter St., Superior, Wis. Est. $215,000. ...nse Plant Corp. will finance. Bids 9/2, ...rded 9/3. CD 8/11—ENR 8/19.

...Nebraska—Anaconda Copper Mining Co., ...25 Bway., New York, N. Y., will design, ...struct and operate extrusion plant for ...nufacture of aluminum and magnesium ...s for aircraft, own forces. Est. $16,000,000. ...conda Alloys Corp. a subsidiary, lessee. ...nse Plant Corp. will finance.

...New Jersey—Socony-Vacuum Oil Co., ...Paulsboro, design and construction oil ...ery, to Lummus Co., 420 Lexington Ave., ...York, N. Y. Est. $1,500,000. Federally ...nced.

...New Jersey—U. S. Eng., 120 Wall St., ...New York, 5, N. Y., military housing, Essex ...to Brown & Matthews, Inc., 122 E. 42 St., ...York, N. Y., $700,000. CD 8/25—ENR 9/2.

...N. Y., New York—Yards & Docks, Navy ...18 St. and Constitution Ave. N.W., ...h, D. C., increased capacity, disciplinary ...racks, receiving station, Hart's Island, ...7069, to Rheinstein Constr. Co., 21 E. ...t., New York, $191,300.

...N. C., Elizabeth City—Yards & Docks, ...y Dept., 18 St. and Constitution Ave. N.W., ...sh, D. C., cafeteria, storehouse and fire ...on bldg., lend-lease modification center, ...6564, to Virginia Engineering Co., Nel... Bldg., Newport News, Va., $164,200.

...Ohio—Goodyear Tire & Rubber Co., 1144 ...Market St., Akron, 2 story, brick, steel ...nsigram factory addn., to Indiana Engr. & ...Co., 169 N. Union Ave., Akron. Est. ...00. Federally financed. J. Gordon ...bull, 2630 Chester Ave., Cleveland, engr.

...Ohio—U. S. Eng., 925 New Federal Bldg., ...burgh, Pa., grading, landscaping site for ..., Cuyahoga Co., to Loesch & Green ...Co., 4311 W. 32 St., Cleveland, ...500. CD 8/4—ENR 8/19.

...Ohio—U. S. Eng., 700 Union Guardian ..., Detroit, 31, Mich., chemical and physi... laboratories, Cuyahoga Co., to Schirmer ...elder Co., 2719 Detroit St., Cleveland, ...than $1,000,000.

...Pennsylvania—Pub. Housing Auth., NHA, ...Bway., New York 7, N. Y., road imprv. ...housing, Pa. 36111, to Burrell Constr. & ...ly Co., foot of 5 St., New Kensington, ...00. Bids 8/26. CD 8/19—ENR 8/12.

...Pa., Phila.—Yards & Docks, Navy Dpt., ...St. and Constitution Ave. N.W., Wash., ..., cable storage bldg., Navy Yard, NOY ... to Raymond R. Rafferty, Inc., 1505 ... St., $110,640. Bids 9/8. CD 9/2—

...R. I., Newport—Yards & Docks, Navy ...18 St. and Constitution Ave. N.W., ...h., D. C., bldg. addn., Naval Torpedo ...on, Goat Island, NOY 7028, to Brown & ...hews, Inc., 122 E. 42 St., New York, ...10. Bids 9/7. CD 9/2.

...Texas—Pub. Housing Auth., NHA, 1205 ...Electric Bldg., Seventh and Taylor Sts., ... Worth, prefabricated dormitory dwell... ...units, Tex. 41-594, to Texas Prefabricated ...e & Tent Co., 163 Avery St., Dallas, ...00,000. CD 7/15—ENR 7/22.

...Utah—U. S. Eng., 32 Exchange Pl., Salt ... City, housing, Solic. 23, Tooele Co., to ...y Bros., 426 Bryant St., San Francisco, ..., $290,000-$300,000.

...Va., Portsmouth—Yards & Docks, Navy ...Dpt., 18 St. and Constitution Ave. N.W., ..., D. C., hospital facilities, wards om... ...quarters, etc., NOY 7320, to Virginia ...neering Co., Melson Bldg., Newport ..., $356,100.

THE FUTURE OF OZONE

is being defined today in the test tubes and equipment of our laboratory staff.

Among the better things America is fighting for, a better way is assured to produce potable and palatable drinking water—thanks to ozone and the current research and development program of this organization.

We invite every progressive water works man interested in a better taste, odor, and color removal process to discuss his problem with us.

Write for our new booklet, "An Introduction to the Ozone Treatment of Water".

OZONE PROCESSES INCORPORATED

1500 WALNUT STREET, PHILADELPHIA, 2, PA.

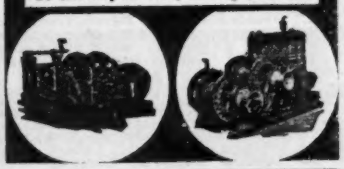
A wholly owned subsidiary of Welsbach Engineering and Management Corp.

THOMAS HOISTS

FINEST QUALITY AT NO PREMIUM

THOMAS HOIST CO.

20 So. Hoyne Ave., Chicago, Illinois



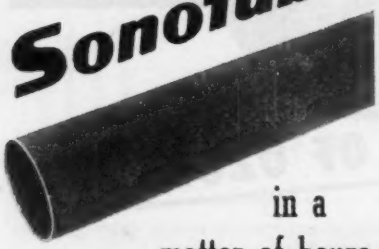
DELAWARE BAY SHIPBUILDING CO., INC.

LEESBURG, NEW JERSEY

BULKHEADS
PILEDRIVING
WHARF CONSTRUCTION
MARINE RAILWAYS

Troweling off- CONCRETE PIERS

Formed with **Sonotube**



in a matter of hours —instead of days

From footings to sills is a matter of 48 hours where Sonotube Concrete Pier Forms are used. The Laminated fibre tubing comes in six standard sizes—

INSIDE DIAMETER					
8"	9"	10"	11¼"	12"	13½"
SQUARE INCHES					
50.26	64	78.54	100	113.1	144

After sawing to lengths—(pier heights) and braced or backfilled it is ready for pouring. Can be stripped off or allowed to slough off.

IMMEDIATE DELIVERY

Widely used and Approved for Cantonments and other Government Construction { U. S. Army Engineers; U. S. Navy Department Yards and Docks; P. B. A. and F. H. A. }

WRITE FOR DELIVERED PRICES

SONOCO PRODUCTS COMPANY

HARTSVILLE, S. C. MYSTIC, CONN.

ROCKINGHAM, N. C. GARWOOD, N. J. LOWELL, MASS.

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

†**Washington**—Kaiser Shipbuilding Co., Vancouver, 1 story, 204x648 ft. warehouse, to Ross B. Hammond Co., 1241 N. Williams St., Portland, Ore., **$250,000.** Federally financed. Awarded 9/11. Wolff & Phillips, 509 Pearson Fourth Ave. Bldg., Portland, Ore., archts.

†**Washington**—Pub. Housing Auth., NHA, Skinner Bldg., Seattle, Zone 1, dormitory housing, to H. R. Olsen, 4040 Pacific Ave., Tacoma, **$282,800.** Bids 9/10. Stuart, Kirk & Durham, 4 and Cherry Bldg., Seattle, Zone 4, archt.

†**Wisconsin**—A. O. Smith Corp., 3533 W. 27 St., Milwaukee, heating and ventilating for propeller plant, to Wenzel & Henoch Co., 1524 W. 27 St., Milwaukee, 5, approx. **$150,000.** Defense Plant Corp. will finance. CD 7/27—ENR 7/29, under CA.

Ont., Ottawa—Dom. Government, Ottawa, wood frame office bldg., concrete fdn., to H. A. Wickett Co. Ltd., 156 E. Front St., Toronto. Est. **$800,000.** Dpt. P. Wks., Ottawa, archts.

Ont., Ottawa—Dpt. Pub. Wks., Ottawa, temporary addn. to Office Bldg. 8, Carling Ave. and Preston St., to H. A. Wickett Co. Ltd., 156 Trout St. E., Toronto. Est. **$350,000.**

Que., Montreal—Governors of St. Luke's Hospital, 1058 St. Denis St., 4 story, bsmnt., 97x97 ft., nurses' residence and tunnel connecting bldg. with hospital, to D. Boileau Ltd., 245 McDougall Ave., Outrement. Est. **$250,000.** CD 8/27.

COMMERCIAL BUILDINGS

PROPOSED WORK

★**Calif., Long Beach**—Home Investment Co., Trust Bldg., plans by R. J. Kieffer, 2212 Griffin Ave., Los Angeles, 300 frame type dwelling units. Over $1,000,000.

La., New Orleans—Pearl Homes, Inc., c/o Pittman Bros. Constr. Co., general contractors, 2800 Galvez St., plans 42 housing units, Franklin Ave. near Eads and Abundance Sts. $150,000.

★**N. J., Somerville**—Somerset Hospital, Rehill Ave., plans by Crow, Lewis & Wick, 200-5th Ave., New York, N. Y., hospital, general alterations, addn. $700,000.

N. C., Boiling Springs—Gardner-Webb Junior College, Bldgs. Over $200,000.

N. C., Wilmington—D. E. Widder, archt. and engr., c/o Atlantic Coast Line R. R., Wilmington, soon lets contract 3 story, bsmnt., 65x197 ft., brick, terra cotta office bldg. $175,000-$200,000. R. W. Marye, Wilmington, ch. engr. CD 9/15—ENR 7/1.

O., Cleveland—Bert Bldg., Co., c/o A. E. Seymour, Union Commerce Bldg., thirty-nine 1½ story, 25x29 ft. brick dwellings. $6,000 ea.

Tex., Lakeview—Selmar Corp., Carthage, 46 dwellings, utilities. $175,000, FHA.

Tex., Pasadena—James T. Taylor, 605 First National Bank Bldg., Fort Worth, soon lets contract asphalt street paving in 180 acre bldg. area, incl. water, sanitary sewer and gas lines and mains, outside lighting distr. sys. $225,000. D. M. Duller, Second National Bank Bldg., Houston, engr. CD 9/14—ENR 9/16.

B. C., Victoria—McCarter & Nairne, archts., 1930 Marine Bldg., Vancouver, soon lets contract 100 frame dwellings, concrete fdns., for Wartime Housing, Ltd., 135 E. 2 St., North Vancouver. Plans deposit $50.

N. S. Pictou—Sutherland Memorial Hospital Bd., Pictou, nurses home and isolation section. $150,000.

Ont., Hamilton—General Hospital Bd., 7 S. Barton St., plans by McDonald & Lenz, 42 N. James St., hospital exten. $150,000.

Ont., Toronto—University of Toronto, c/o Rev. H. J. Cody, pres., Toronto, laboratory bldg. to be used for large-scale production of Penicillin. $150,000.

Que., Amos—Anti-Tuberculosis League of Quebec, c/o Hon. G. Dansereau, Dpt. P. Wks., Quebec City, sanatorium for treatment of tuberculosis. $250,000.

Que., Chicoutimi—Hotel Dieu Administration, c/o Rev. Superior St. Marguerite-Marie, 22 St. Vallier St., plans by Lamontagne & Gravel, 35 Racine St., 52x118 ft. addnl. wing, $400,000, Laroie & Delisle, 35 Racine St., engrs.

BIDS ASKED

Tex., Brownsville—Thos. Joseph, Embee Bldg., Harlingen, thirty-five 1 story, sheetrock and Texstone dwellings. $200,000. CD 9/3—ENR 9/9.

★**Tex., Houston**—Collins Development Co., J. S. Collins, Jr., Market Rd., four hundred 1 story, frame dwellings. $1,750,000. FHA. D. M. Duller, 2nd National Bank Bldg., engrs. CD 9/11—ENR 9/16.

Wis., Sturgeon Bay—G. J. Feldhausen & G. C. Coughlen, archts., Columbus Bldg., Green Bay, 1 story, bsmnt., 47x83 ft., and 23x36 ft. brick hospital bldg. addn. and remodeling, incl. two 50 hp. boilers, Proj. 4301, for Egeland Memorial Hospital.

CONTRACTS AWARDED

Calif., Roseville—Selborne Investment Co., 5045 Cochrane Ave., Oakland, 32 residences to T. M. Almquist, 5045 Cochrane Ave., Oakland. Est. **$160,000.**

Calif., San Mateo—David Bohannon, 111 Market St., San Francisco, 60 residences in Shoreview Tract. Owner builds. **$180,000.**

Calif., San Mateo—Conway & Cullinan, Monadnock Bldg., San Francisco, 22 duplex residences. Owner builds. **$154,000.**

Calif., Sunnyvale—Bohannon & Chamberlain, 1608 El Camino Real, San Carlos, 76 residences. Owner builds. **$216,000.**

Calif., Sunnyvale—Samuel L. Hyman, 49 Post St., San Francisco, 100 residences, Palo Oaks Ave., to Ray Agnoletti, 1062 Lick Ave., San Jose. Est. **$300,000.**

Calif., Sunnyvale—Pioneer Homes Construction Co., 333 El Camino Real, Palo Alto, 46 residences, to J. H. Rodda, 333 El Camino Real, Palo Alto. Est. **$198,000.**

Ind., Anderson—St. Johns Hospital, 900 Jackson Ave., 4 story, 50x96 ft., brick, steel, steel hospital addn., to Albert J. Glaser, 40 S. Lincoln St., Muncie. $200,000, cost plus percentage basis. CD 9/15.

Ind., Batesville—W. Scholer, archt., 114 Main St., Lafayette, 2 story, bsmnt., brick, concrete hospital, for Mary & Margaret Hospital, Batesville, to Wm. Gutzwiller Co., Batesville. Est. **$250,000.** Awarded 9/3. CD 8/30—ENR 9/2, under Public Bldgs.

N. J., Middlesex—Lincoln Homes, 142 Springfield Ave., Rutherford, thirty-one 1¼ story cinder block, brick residences, separate contracts. **$150,000.** P. Simon, 608 Wyndham Rd., Teaneck, archt.

Tex., Houston—J. J. James, 5123 Hufsmith Ave., 25 dwellings, facilities, utilities, etc. Owner builds. **$150,000.** CD 9/9—ENR 9/16.

Tex., Texas City—The 3rd Ave. Corp., c/o I. G. Sharp, Texas City, 12 brick, structural clay tile apartment bldgs., and addnl. apartment houses, dwellings. Owner builds. **$445,000.** FHA. CD 9/9—ENR 9/16.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ark., North Little Rock—WAREHOUSE, etc.—Dyke Brothers Lumber Co., C. L. Bridenthal, mgr., 4 and Poplar Sts., tile, brick, concrete warehouse and office bldg. $40,000.

Ark., Siloam Springs—PLANT—Pet Milk Co., B. Timmer, constr. supt., Arcade Bldg., St. Louis, Mo., milk condensing plant.

Conn., Milford — PLANT — Owner, c/o Fletcher Thompson, Inc., archt., 211 State St., Bridgeport, sketches plant addn. Over $40,000.

Miss., Hazlehurst — WAREHOUSE — Mississippi Compress Co., rebuilding compress warehouse bldg.

Mo., St. Louis—SHOP—Terminal Railroad Assn., of St. Louis, 1300 Market St., Zone 8, shop buildings replacing structures destroyed in recent fire. $40,000, incl. equip.

Neb., Gibbon — POWER STATION — Nebraska Mid-State Public Power & Irrigation Dist., Odessa, constructing Buckeye power station, 5 mi. northwest of here. $312,000.

★**Neb., Odessa**—POWER STATION, etc.—Nebraska Mid-State Public Power & Irrigation Dist., Odessa, constructing Wood River power station, 4 mi. north of here, $747,500; constructing Odessa power plant, 1 mi. north of here, $156,000.

Neb., Shelton—POWER PLANT—Nebraska Mid-State Public Power & Irrigation Dist., Odessa, constructing Upper Prairie Creek power plant, 6 mi. north of here. $335,000.

N. C., Charlotte—WAREHOUSE, etc.—The John Crosland Co., J. Crosland, pres., 112 E. 4 St., warehouse and office bldg., South Blvd. About $40,000.

O., Cleveland—HEATING PLANT—Forbert-Schorndorfer Co., D. Andrews, pres., 1201 Elmwood Ave., brick, rein.-con. heating plant. $50,000. George S. Rider Co., Terminal Tower, engrs.

★†**Pennsylvania**—COAL PLANT—U. S. Coal & Coke Co., H. M. Moses, pres., Frick Bldg., Pittsburgh, coal preparation plant and coal cleaning plant, Robena Mine on Monongahela River, Greene Co. $5,500,000.

Tex., Houston—PLANT—Reed Roller Bit Co., Mack St., plans by H. Loyd, 4606 Main St., trose St., 2 story, plant bldg. Over $40,000.

Wis., Green Bay—WAREHOUSE—McCrossan Lumber Co., 908 N. Bway., plans by G. J. Feldhausen & G. C. Coughlen, Columbus Bldg., 1 story, 90x110 ft., brick warehouse addn., concrete fdn. $40,000.

BIDS ASKED

Bids Asked about October 1

Tenn., Cleveland—LOCKER REFRIGERATION PLANT—Chickamauga Producers Assn., c/o E. E. Shouse & F. Knox Haris, 600 etc., locker refrigeration plant.

STRIAL BLDGS. (Bids Asked, Cont'd.)

Fort Wayne — FACTORY — H. M. archt., 415 Cal-Wayne Bldg., 1 story, brick, steel factory addn., for Farnsworth Television & Radio Corp., E. A. Nicholson, 3702 Pontiac St. $250,000.

Painesville — FACTORY — Industrial Corp., W. 98 St. and Walford Ave., group buildings for manufacture tenacity tire yarn, to Austin Co., Euclid Ave., Cleveland. Total est. incl. $5,000,000. CD 9/3—ENR 9/9.

Dallas—FACTORY—Guiberson Corp., Elm St., factory bldg., incl. air-condi- sys., sprinkler sys., etc. $45,000. CD ENR 9/16.

Toronto—MILL—Prack & Prack, Pigott Bldg., Hamilton, sheet metal dds., Weston, near here, for Moffatt's 23 Dennison Ave., Weston. $45,000. CD ENR 9/16, under Weston.

RACTS AWARDED

Jersey—MANUFACTURING—Electric Workers Co., 163 Avenue A, Bayonne, 1 75x180 ft. steel boat mfg. bldg., to Steel Structures, Inc., 1433 38 St., lyn, N. Y. $40,000. R. Peck, 40 Canter- Lane, Westfield, archt.

J., Englewood—MARINE—L. F. Diets Englewood, interior and exterior al- ns to marine bldg., to F. & C. Haerter, Dewey Ave., West New York, $40,000. ght, 19 Knickerbocker Rd., archt.

, Harrison—HEAT TREATMENT—Otis or Co., 606—First St., 1 story, brick, te block heat treatment bldg., to Lam- Hughes, 177 Van Houten St., Paterson, .

, Kearny—LOCKER—Poliak, Inc., 306- huyler Ave., locker bldg., to Becker , Co., 381 Grove St., Newark, $40,000. rstmann, c/o owner, archt.

Phila—ELECTRO PLATING PLANT— l Electric Co., 6901 Elmwood Ave., plating plant, to United Engineers & uctors, Inc., 1401 Arch St., $223,700. ed 9/16.

Dallas—FACTORY—Guiberson Corp., lm St., factory bldgs. Owner builds, .

Houston—PLANT—National Supply 239 Navigation Blvd., 1 story, struc- clay tile garment mfg. plant, concrete F. McNeil, 2603 Chartres St. Est. CD 9/3—ENR 9/16.

Houston—REFINERY—Phoenix Refin- g., 730 Manchester, refinery reconstruc- mprvs., including cooling towers, pump. stills, various pipelines, steel tanks, force account. $70,000. CD 9/15.

Raymondville—PLANT—Delta Canning story, 60x100 ft. citrus and vegetable ing plant. Owner builds. $40,000. CD ENR 9/16.

Green Bay—LUMBER—MILL—Stand- mber Yards, Inc., 1101 Cedar St. .1 story, ft., frame lumber mill, to Selmer Co., rn Bldg. Est. $40,000.

Medford—SPRAY DRYER—Medford rative Creamery, 2 story, 62x60 ft., stone spray dryer bldg., to Hoffman Co., 1519 N. Oneida St., Appleton. Est. Oppenhamer & Obel, Wausau and Bay, archts.

Mishicot—BOILER HOUSE, etc.— n Condensing Co., 935 E. John St., Ap- 1 story, 40x55 ft. boiler house and re- ng Whey Power Plant, to Miron & St. Constr. Co., 139 N. Story St., Appleton. ,000.

Racine—PURIFYING PITS—Wisconsin Electric Co., 100 3 St., 3 purifying pits, on., to Johnson & Henrickson, 422 Dodge t. $120,000.

Wausau—FACTORY—Marathon Foun- Machine Co., 1212 West St., 1 story, and 40x72 ft., concrete block factory concrete fdns., to C. J. Lang, 203 Bway. ,000. Oppenhamer & Obel, Wausau,

Wausau—FACTORY—Marathon Bat- a, 840 Henrietta St., 1 story, 34x100 ft., factory addn., concrete fdn., day labor. aamer & Obel, Wausau, archts. CD 8/3 8/5.

Granby — PLANT — Stark Brothers Corp. of Canada, Ltd., 7 St. Charles ant addn., to C. Marquis, 252 Park St. ,000. CD 8/4—ENR 8/5.

Longueuil—SHOP—Canadian Pratt & y Co., Ltd., Longueuil, 1 and 2 story, ed exten. to propeller overhaul shop, to and Conet. Co., Ltd., 1440 St. Cathe- W., Montreal, $85,000. E. J. Turcotte, St. Catherine St. W., Montreal, archt.

Montreal—GRAIN STORAGE UNIT— Flour Mills Ltd., 930 Mill St., grain unit, rein.-con., to E. G. M. Cape & Co. 320 Cathcart St. Est. $150,000. R. A. Ran- Co., 1420 W. Sherbrooke St., engr.

Additional Advertisements see p. 200 & 217
Postwar Projects see p. 188

When Speed Is Vital— Then "CLEVELANDS" Are Indicated

For Digging Trench for:
WATER—OIL—GAS—GASOLINE—COMMUNICATION and POWER LINES . . . And for SEWER and BUILDING FOUNDATIONS

For speed, power and dependability—for mobility and economy—for ability to meet field requirements, on your ditching job, in all kinds of soil, and various types of terrain "CLEVELANDS" are TOPS in ditching value.

THE CLEVELAND TRENCHER COMPANY
20100 ST. CLAIR AVE. "Pioneer of the Small Trencher" CLEVELAND, OHIO
"CLEVELANDS" Save More . . . Because they Do More

COMPLETE WELL POINT SYSTEMS
IMMEDIATE STOCK SHIPMENTS
Rentals or Sales
19 YEARS of Loyal Service to the Construction Industry is our "Best Sales Talk"
ORGANIZATION • EXPERIENCE • RESPONSIBILITY
Serviced and Sold by One of the Largest Organizations of Its Kind
COMPLETE Machinery & Equipment Co., Inc.
MAIN OFFICE AND PLANT LONG ISLAND CITY, N. Y.
Phone Ironsides 6-8600
Branch Warehouse: Gary, Ind. Office: 125-168 St., Hazelcrest, Ill. Phone: Harvey 2912

THE MOST FOR THE MONEY — SPEED - EFFICIENCY - ECONOMY

CONSTRUCTION BY CONTRACT

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC. · MUNSEY BLDG., WASH. D.C.

(U. S. Government)

Bids: (180)
UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C., September 15, 1943. Sealed bids (Specifications No. 1059) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 10 a.m., October 11, 1943, and then publicly opened, for furnishing labor and materials and performing all work for the *construction of Shadow Mountain Dam and Dikes*, Colorado-Big Thompson project, Colorado. The work is located approximately eleven miles northeast of Granby, Colorado.

The principal items of work and the estimated quantities involved are as follows: 10,000 cubic yards of excavation, stripping borrow pits; 75,000 cubic yards of excavation, common, for foundations of dam and dikes; 2,000 cubic yards of excavation, rock, for foundations of dam and dikes; 82,000 cubic yards of excavation, common, for spillway; 2,000 cubic yards of excavation, rock, for spillway; 240 cubic yards of backfill; 68,000 cubic yards of excavation, common, in borrow pits and transportation to dam and dike embankments; 10,000 cubic yards of excavation, rock, in borrow pits and transportation to dam and dike embankments; 153,000 cubic yards of earth fill in embankments; 29,000 cubic yards of cobble and rock fill on downstream slopes of embankments; 18,000 cubic yards of riprap on upstream slopes of embankments; 760 cubic yards of dumped riprap in spillway channel; 2,200 cubic yards of concrete in spillway floors; 7,300 cubic yards of concrete in spillway walls; 230 cubic yards of concrete in spillway pier and bridges; 1,100 cubic yards of concrete in spillway-gate structure; constructing 450 linear feet of 4-inch diameter sewer-pipe drains with uncemented joints embedded in gravel; constructing 825 linear feet of 6-inch diameter sewer-pipe drains with uncemented joints embedded in gravel; constructing 1,325 linear feet of 8-inch diameter sewer-pipe drains with uncemented joints embedded in gravel; laying 30 linear feet of 4-inch diameter sewer pipe with cemented joints; laying 100 linear feet of 8-inch diameter sewer pipe with cemented joints; placing 470,000 pounds of reinforcement bars; installing 42,000 pounds of radial gates; installing 13,000 pounds of radial-gate hoists; installing 100 pounds of float-well intake piping; installing 1,650 pounds of slide gate; installing 5,200 pounds of miscellaneous metalwork; erecting 5 M ft. b.m. of temporary wooden handrails; installing 300 linear feet of electrical metal conduits; and installing 120 pounds of electrical conductors, ground wires, and apparatus. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. The work shall be commenced within thirty (30) calendar days after date of receipt of notice to proceed and shall be completed within three hundred (300) calendar days from the date of receipt of such notice: Provided, That the 300 calendar days stated above shall be exclusive of the period of time from December 15, in any year to April 15, inclusive, in the next succeeding year. Guarantee will be required with each bid in an amount not less than 10 percent of the amount of bid. Performance bond will be required in an amount not less than 50 percent of estimated aggregate payments to be made under the contract. Payment bond will be required in the sum of one-half of total amount payable by the terms of contract. Liquidated damages for delay will be one hundred dollars ($100) per day. Partial payments will be made monthly. No charge to prospective bidders for copies of the specifications and drawings; to others, $3.00 per copy, not returnable. For particulars, address the Bureau of Reclamation, Denver, 2, Colorado; Washington, 25, D.C. H. W. Bashore, Commissioner.

Additional OFFICIAL PROPOSAL Advertisements on page 217

WHERE TO BUY

Featuring additional products, specialties, and services for the Construction Industry

TERRY ENGINEERING COMPANY
STEEL ERECTORS
BRIDGES - TOWERS - BUILDINGS
TANKS AND WELDING
103 Park Avenue, New York, N. Y. MUrrayHill 5-0166
Colorado Bldg., Washington, D. C. MEtropolitan 2028

IMMEDIATE DELIVERY
With "Preference Rating"
UNIVERSAL Level - Transit
Telescope 12" long, 25 Power—Horizontal Circle 4½" with vernier to 1 minutes—Vertical Arc 3"—Instrument weighs 11 pounds, tripod 9 pounds.
Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap $115.00. Can be furnished with a compass at $12.50 extra.
ORDER BY MAIL
Expert Repairing of All Makes of Instruments
FREE INTERESTING BOOK—"HOW TO LAYOUT BUILDING LOTS"—FREE—WRITE TODAY
DAVID WHITE COMPANY 305 W. Court Street, Milwaukee, Wisconsin

BLASTING ENGINEERS
We Specialize in the REMOVAL of SALAMANDERS, CONCRETE FOUNDATIONS, SLAG DEPOSIT POCKETS, ROCK, Etc., Etc.
CHICAGO CONCRETE BREAKING CO.
Edw. Gray, Pres.
6247 Indiana Ave., Chicago NORMAL 0900

Lumber—SALE—Timber
Available for immediate deliveries from stock large quantities of Yellow Pine and Fir from 4" x 4" up to 16" x 16" in lengths up to 40' in all normal commercial grades.
DORAN LUMBER CORPORATION
1036 Grand Street, Brooklyn, N. Y.
Phone: EVergreen 7-8450

A Good Habit
This "Where to Buy" Section supplements other advertising in this magazine. . . It's a good habit to check this page—every issue.

Let Us Write Your Contract Bonds — Agents From Coast to Coast
THE ÆTNA CASUALTY and SURETY COMPANY
HARTFORD CONNECTICUT

EN
NE

Army Engine